

The
Picturesque
West

The title is set against a textured, brownish-gold background. The word 'The' is in a simple, elegant script at the top. 'Picturesque' is in a large, bold, blackletter-style font, with its initial 'P' being a large, ornate, three-dimensional letter that overlaps the landscape illustration. 'West' is in a similar blackletter font, with its initial 'W' also being a large, ornate, three-dimensional letter. The background illustration depicts a rugged landscape with a winding river or path leading towards a distant, hazy horizon. A tall, thin, vertical structure, possibly a lighthouse or a tower, stands prominently in the center-right. A circular inset, resembling a porthole or a lens, is positioned in the lower right, showing a detailed view of a rocky coastline with a small building or structure. The entire design is framed by decorative, swirling lines and a ribbon-like element.




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A VISION OF THE PICTURESQUE WEST.

THE PICTURESQUE WEST.

OUR

Western Empire Beyond the Mississippi.

CONTAINING

THE MOST COMPLETE DESCRIPTION, FROM OFFICIAL AND OTHER AUTHENTIC SOURCES,
OF THE GEOGRAPHY, GEOLOGY, AND NATURAL HISTORY, THE CLIMATE, SOIL,
AGRICULTURE, AND THE MINERAL PRODUCTS, THE CROPS, AND HERDS
AND FLOCKS, THE SOCIAL CONDITION, AND FUTURE PROS-
PECTS OF THE WHOLE REGION LYING BETWEEN THE
MISSISSIPPI AND THE PACIFIC OCEAN.

BY H. L. WILLIAMS.

WITH NUMEROUS ILLUSTRATIONS

BY THE MOST DISTINGUISHED ARTISTS.

NEW YORK :
HURST & COMPANY,
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THE PICTURESQUE WEST

OR

OUR WESTERN EMPIRE BEYOND THE MISSISSIPPI.

PART I.

CHAPTER I.

WHAT IT COMPREHENDS—THE WEST BEYOND THE MISSISSIPPI—ITS AREA AND EXTENT—COMPARISON WITH OTHER EMPIRES—CLIMATE—MOUNTAINS—NATURAL PHENOMENA—SOIL—THE ALKALINE, VOLCANIC AND “BAD LANDS”—PREDOMINANCE OF ARABLE AND PASTURE LANDS—NUTRITIOUS GRASSES IN THE GRAZING LANDS.

“OUR WESTERN EMPIRE” is of greater extent than any other Empire of Christendom except Russia and Brazil, and in population, enterprise, and advantages for future growth is the peer of any; but it has no monarch, hereditary or elective, to rule its wide domain. It forms a large part—more than two-thirds of the Great Republic of the United States of America, and over all its vast extent, an intelligent and industrious, moral and capable people rule themselves. Their chief magistrates, their governors and executive officers, are men of the people, selected by the people, for short terms of service, and replaced by others, when those terms expire.

What, then, do we understand “Our Western Empire” to comprehend? All of that portion of the United States lying west of the Mississippi, and including the new Territory of Alaska. Its northern boundaries are the Arctic Ocean and Behring’s Sea and Straits west of the 140th meridian; and east of that, British America; its western limit the Pacific Ocean; its southern, Mexico and the Mexican Gulf; its eastern, the Mississippi river

from its mouth to the Canada line, and the west line of British America, above the fifty-fourth parallel. It has an area of 2,671,884 square miles, of which 577,390 or about one-fifth, belongs to Alaska. It extends over 42° of latitude, and in its farthest western boundary, "by Ounalaska's lonely shore," over 103° of longitude.

Leaving Alaska out of the question, as a mere dependency, the remainder of "Our Western Empire" comprises 24° of latitude and 36° of longitude, having a breadth of nearly 2,000 miles from east to west, and a length from north to south of 1,700 miles, with an area of 2,094,494 square miles. The whole of Europe except Russia, including the great German Empire, the Austro-Hungarian Empire, the Republic of France, the United Kingdom of Great Britain and Ireland, the Kingdoms of Turkey, Italy, Spain, Portugal, Sweden, Norway and Denmark, and the minor States and principalities, have in all only an area of 1,678,791 square miles, about four-fifths of "Our Western Empire" exclusive of Alaska, or including it, less than three-fifths. Its population is of course much less than that of the larger European States, though somewhat greater than that of the Brazilian Empire, and increasing at a rate never equalled in the world's history.

No empire in the world has a greater diversity of climate; from the more than six months' winter of the northern border, and the mountainous regions, on some of which rest eternal snows, to the tropical heats of Arizona and Southern Texas, there is the greatest possible diversity of moisture and drought, of heat and cold, of moderate, equable and health-giving temperature, and of rapid change, and fickle, inconstant skies. Like other large empires, it has great diversities of surface. Three ranges of lofty mountains traverse it from north to south with their numerous outlying spurs, their broad plateaux and table-lands rising to a height of 6,000 to 9,000 feet, their *mesas* or isolated flat-topped mountain summits, their deep and terrible cañons, and their long valleys, sometimes narrow and precipitous, sometimes broad seas of verdure and flowers. These are: the Rocky Mountains, appropriately named "the backbone of the Continent," and occupying a

position about midway between the Mississippi river and the Pacific Ocean; west of these, and parallel with them, the Sierra Nevada, or Snowy Range, whose peaks tower up into heights corresponding with those of the Alps; and still farther west, and looking out upon the Pacific, the Coast Range, generally of lower altitude, but containing some lofty summits, whose snow-clad tops are the landmarks of the coast. Between the Rocky Mountains and the Sierra Nevada, is the great Utah or Salt Lake Basin, a vast depressed tract, none of whose streams flow outward, and some of whose lakes are salt and bitter. It has also its volcanic regions, and areas of erosion, where Dame Nature has played most fantastic tricks, now rearing lofty statues, monuments, castles, cathedrals, gateways, now scooping out vast series of basins of mineral waters either hot or cold, such as put all artificial baths to shame; anon sending at intervals its geyser-fountains two hundred and fifty feet into the air; or filling the quaking and trembling earth with jets of hot steam, reeking with sulphurous odors. At some points, after a fearful descent into some apparently dark and gloomy ravine or cañon, all the hills or mountains around one seem to have put on their holiday attire; one has donned for its bridal veil a beautiful and semi-transparent waterfall, whose height is so great that the water seems pulverized into glittering dust ere it reaches the valley; another, with a greater supply of water, forms four or five gigantic cascades, each higher than Niagara, in its downward career; while still another, in a rift between the mountain summits, forms a stream of moderate size in a perpendicular fall, a thousand feet or more, sheer down into the valley. Broad lakes, some of them salt and some fresh, with many outlets or with none, are found on mountain tops or in the centre of wide valleys; while, as we have said, one vast basin has its own system of lakes and rivers which find no way of reaching the sea.

Like other empires, not all the land has a rich and fertile soil. There are mountains, where the rocks are cold, bleak, bare and precipitous; there are cañons and ravines, whose nearly perpendicular walls, from 3,000 to 6,000 feet in height, only let in the sunlight at midday, and their clayey and rocky sides, of parti-

colored hues, afford no hold for weed, vine, shrub or tree. There are plains, plateaux and *mesas* covered with alkaline powder, and having as their only vegetation the gray, lichen-hued sage-brush; plains on which the gentle rain and soft falling dew seldom or never descends—yet these monotonous and apparently barren plains, under the influence of irrigation, yield most abundant crops, and even the despised sage-brush furnishes a delicious pasturage for cattle. There are also considerable tracts where, in former times, the eroding influences of mountain streams have cut the deep strata of clay into the most fantastic forms—lands so utterly barren, that no toil could extract from them the least vestige of a crop—the “Bad Lands” of the Canadian trappers; and there are also some stretches of volcanic lands, for one of which the foul and mephitic vapors, and the earthquake shocks, have prompted the expressive name of Death Valley.

But while these extraordinary displays of the power of natural forces render this Great West a true Wonderland, they really comprise but a small proportion of its surface, and no region of equal extent has a larger proportion of available and productive lands. The quantity of arable soil is immense. The wheat fields of Iowa, Minnesota, Northern and Southeastern Dakota, Kansas and Nebraska, the lands suited to the growth of Indian corn in these States and Territories, and in Missouri, Arkansas and the Indian Territory, and in portions of Colorado and New Mexico, the cotton lands of Texas, Arkansas and New Mexico, and, on the Pacific slope, the wheat and barley fields and the vineyards and orchards of California, the wheat and corn fields of Oregon and Washington, are beyond all comparison for excellence, on this continent or any other.

In the way of grazing lands, no other country can compare with them. There are not only the cattle upon a thousand hills or plains, but thousands and tens of thousands of cattle on each vast plain or mountain slope. The States and Territories of Texas, New Mexico, Arizona, Colorado, Wyoming, Utah, Northwestern Dakota, Montana, Idaho, Oregon, Washington and California, can furnish, within a few years, all the beef and mutton needed to feed the rest of the world. The grasses here are

more nutritious and fattening, and give to the flesh of the cattle a more gamey flavor than those of any other known country; and even those lands which were at first reckoned as portions of the Great American Desert, lands given over to alkaline deposits and sage-brush, and on which there was but very little rainfall, now prove admirably adapted to pasturage, and, either with or without irrigation, most bounteous in their production of grain and root crops. And in this connection we may well raise the question which we next discuss.

CHAPTER II.

THE GREAT AMERICAN DESERT: WHERE IS IT?—THE HUNDREDTH MERIDIAN—“ELI PERKINS’S” SCARE—THE FACTS IN REPLY—COLONEL (BREVET BRIGADIER-GENERAL) HAZEN ON THE NORTHERN PACIFIC—GOVERNOR HOWARD’S ANSWER, AND OTHER FACTS—DAKOTA—WYOMING AND ITS AGRICULTURE—MONTANA—B. R. AND MR. Z. L. WHITE ON ITS CROPS—THE SMALL MODICUM OF TRUTH IN THESE “DESERT” STORIES—THE REPORTED “DESERT” BEYOND THE ROCKIES—THE UTAH AND NEVADA DESERT—TESTIMONY OF SURVEYORS-GENERAL—THE TEXAN DESERT AND ARIZONA—THE GREAT AMERICAN DESERT A MYTH.

THIRTY or forty years ago all our maps had a wide space, and some of them two or three wide spaces, inscribed, “Great American Desert.” Nearly the whole of the present States of Kansas, Nebraska and Colorado, and Western Minnesota; the Territories of Wyoming, Dakota, Montana, and Idaho, Western Texas, and after we had conquered “a piece” from Mexico, Arizona, most of New Mexico, Utah and Nevada, were included in this comprehensive designation. By and by silver, and some gold, were found in Nevada, and in the neighborhood of Pike’s Peak, in what is now Colorado; but though the existence of the precious metals there could not be denied, yet the terrors of the desert to be passed through (terrors of whose reality the wagon-trail marked at almost every step by skeletons of cattle, and too often, alas! by the bones of emigrants, gave most ghastly proof) were such that only the most stout-hearted could brave them.

After some years the tide of emigration, which at first had

been confined to the eastern counties of Kansas and Nebraska, and had not reached the western counties of Iowa, and still less those of Minnesota, began to rise and overflow the adjacent counties and districts. The Union Pacific, the Northern Pacific, the Kansas Pacific, and the Atchison, Topeka and Santa Fé Railways had plunged into this desert, and being all land grant roads, had made the discovery that these lands were not really a desert, but were capable of yielding excellent crops, and of furnishing superior pasturage to cattle and sheep. The line of settlement has advanced with each year till now it has reached the 101st meridian west from Greenwich, in Kansas, Nebraska and Dakota, and overleaping all barriers has extended to the foothills and peaks of the Rocky Mountains in Colorado, Wyoming and Montana, and with moderate irrigation has produced from these supposed desert-lands the most astonishing crops, and has furnished, as we have already said, pasturage so rich and abundant, to hundreds of thousands of cattle and sheep, that their flesh is more highly prized than any other in the market.

Yet there have not been wanting those who from one motive or another, have sought to depreciate these lands, and have declared, in the face of the most conclusive evidence, that the whole region west of the 100th meridian was a barren desert, incapable of producing crops or furnishing pasturage sufficient for the subsistence of men or animals, and that it would remain so until God changed the physical laws which govern the distribution of clouds, and rain, levelled the mountains, and made the climate like that of the East. It is very easy to theorize on these matters, and to demonstrate that because, according to certain premises, a certain result should follow, therefore it will inevitably follow; but he is not a wise man who neglects to test the truth of his theories by facts.

The two regions, which, within the past decade, have been persistently denounced by these pseudo-scientific theorists as portions of the Great American Desert, rainless, treeless, barren and incapable of ever being inhabited, are the regions lying near the 100th meridian west from Greenwich and westward indefinitely,

though some of these pessimists admitted that there might be some fertile valleys among the Rocky Mountains; and second, the region from about the 107th meridian westward to the 114th. The first tract includes Western Texas, at least two-thirds of the Indian Territory, the western third of Kansas, almost half of Nebraska, Eastern New Mexico, more than half of Colorado, nearly all of Wyoming, more than half of Dakota, and the whole of Montana. In regard to Kansas, Nebraska, and Colorado, as late as the winter or early spring of 1879, Mr. Landon, a popular lecturer, better known to the public under his *nom de plume* of Eli Perkins, published in the Cincinnati *Enquirer*, and soon after in the New York *Sun*, the following article:

LET EMIGRANTS WESTWARD LOOK OUT!

An awful trap is being set for credulous emigrants. Thousands of these emigrants are settling west of the rain belt, and they don't know it. They are going out too far on the Atchison, Topeka and Santa Fé, the Kansas Pacific, the Union Pacific, and the Northern Pacific Railroads.

"Where is the drought line?" asks the reader.

"Draw a line from Austin, Texas, to Bismarck, Minnesota, on the Northern Pacific, and all west of that line is the drought country. Five years out of eight, crops will entirely fail west of this line. Last year was an exception to the rule, and this is why so many emigrants are venturing too far West this year. The land-sharks are deceiving them, and are pushing a vast army of emigrants into a famine region."

"What makes this region west of the rooth parallel a desert region?"

"Because it rains just as much water as there is water evaporated each year. If it rained more water than is evaporated, it would run down into the ocean, and the land would soon be covered with water. Rains run to the ocean in rivers, and the air evaporates the water of the ocean and carries it inland. Clouds form rainfalls, and back goes the water on to the earth, then into the ocean again. Now, before the air from the Gulf or ocean reaches Bismarck, or the middle of Nebraska or Kansas, this wet air which started from the ocean becomes dry. There is no water in it; the water has all fallen out of it in rain, and it has run back to the sea."

"But why is San Antonio subject to drought when it is so close to the Gulf?"

"Because the air of San Antonio, on the Staked Plains in Texas, and in Arizona, comes up through Mexico. It is dry before it starts. It does not come from the Gulf. Mexico is hot. A perpetual current of hot, dry air blows over Mexico and fans Arizona, New Mexico, Utah and Colorado with atmosphere as dry as wind from the Desert of Sahara. This dry-air current, blowing

up from Mexico and Arizona, strikes the high mountains in Colorado. Here, in the centre of the continent, within seventy-five miles of Pike's Peak, is the source of the Red, Colorado, Rio Grande, Arkansas and Missouri rivers. This is the backbone of North America. The high, cold peaks condense any moisture that there may be in the air coming up from the south, and make it into snow. Then this cold, dry air passes on up the centre of the continent, making a perpetual desert. It prevents any damp air from coming east of the 100th parallel. When we reach the Northern Pacific and Manitoba another current of wind, a damp current, blows from the Pacific Ocean. There is no desert there, where the Pacific wind heads off the wind from Mexico. Now, I say, thousands of innocent emigrants have taken up farms during the last year west of the rain parallel. Of course they will be ruined, and you will see them coming back broken-hearted and discouraged."

"Will it always be a desert west of the 100th parallel?"

"Yes, until the Almighty changes the course of the winds, takes down the mountain-peaks, and stops the clouds from raining all their water out in the East before they get to the desert."

ELI PERKINS.

We will not stop here to notice the deplorable ignorance manifest in almost every line of this article of Eli Perkins, ignorance which would cause any intelligent school-boy of twelve years old to blush with shame, such as persistently speaking of meridians of longitude as parallels; locating Bismarck in Minnesota, mistaking the longitude of the places of which he speaks, and contradicting himself by saying in one sentence that the air which reaches Bismarck is dry, and there is no rain in it, and in the next that "when we reach the Northern Pacific and Manitoba, another current of wind, a damp current, blows from the Pacific Ocean. There is no desert there, where the Pacific wind heads off the wind from Mexico." Yet Bismarck is on that Northern Pacific Railroad, and just south of Manitoba. It would be as well for "Eli Perkins" to go to school for a few months before he attempts to write for the papers.

But while it is almost mathematically proved that the "Great American Desert" is a myth, receding from us as we try to approach it, it is not to be denied that here, as in other empires, there are some desert lands, treeless, though not quite rainless:

often incapable of cultivation, though they may be rich in fossils or in the precious metals; and that in these deserts may be found some of the most wonderful phenomena on the globe.

CHAPTER III.

THE WHOLE REGION ABOUNDING IN MINERAL WEALTH—PRODUCTION OF GOLD AND SILVER, OTHER METALS, ETC.—FORESTS—GRASSES—ROOT CROPS—FRUITS—VINICULTURE.

MOST of these States and Territories abound in mineral wealth. All the Territories and all the States except Minnesota, Nebraska and Kansas have either gold or silver mines or both, and it is by no means certain that even these will prove to be exceptions, though it is to be hoped they may; for agricultural products furnish a surer and better avenue to the prosperity of the entire population, than the richest mines of the precious metals. The golden grain of these States is a better possession than the gold mines of California or Colorado, or the silver of Nevada or Montana.

Yet we would not underrate the vast mineral wealth of this Western Empire. It is possible, though not at all certain, that some of the Peruvian mines or those of Mexico may have more extensive deposits of gold or silver than are already opened, or are yet to be discovered in the Great West; but the production of none of them has been as great, in so short a period, as that of our mines, and we have just arrived at a stage of progress, when our production may be almost indefinitely increased. During the first ten years after the discovery of gold and silver in California, and the West, it is difficult to estimate with accuracy the production of the precious metals there; but Professor Rossiter W. Raymond, who has devoted much time and study to the problem, names, as the result of his inquiries, a sum total of gold and silver which, by adding the production of 1878 and 1879, gives an aggregate for the Great West for the thirty years ending

June 30, 1879, of \$1,947,055,834, almost two billions of the precious metals. By a singular coincidence these are very nearly the amount of the product of the ten principal items of our agriculture for the year 1879. That product was \$1,904,480,659. The completion of the Sutro tunnel in Nevada, which will make deep mining practicable, in those hitherto productive lodes, and the discoveries of carbonate ores of silver and chlorides or horn silver in Utah, in the San Juan and Gunnison districts and elsewhere, on the western slopes of the Rocky Mountains in Colorado, the new and extensive deposits of both gold and silver in the Black Hills, in Utah and in Montana, and the increasing annual production of bullion, warrant the belief that we are just entering upon a new era in the production of the precious metals, which will far exceed that of the combined production of the Pacific States and Australia, twenty-five years ago.

But our mineral productions in our Western Empire are by no means confined to gold and silver. *Quicksilver*, which is an absolute necessity for gold mining the world over, is more abundant in California, Nevada and Arizona than anywhere else in the world, and though, in the past, tedious litigation has prevented the mines from yielding their full product, yet not only has the large demand for our own mines been supplied, but we have exported millions of flasks to other countries. Nickel, platinum, and in vast quantities, copper, lead, iron and zinc, are among the products of this young empire; and coal of all qualities is scattered in localities where it is most needed.

Portions of this Western Empire are lacking in forest growths. The vast prairies and plains east of the Rocky Mountains had been so often burned over by the Indians, either carelessly or to promote the growth of the grasses, on which the buffalo, their principal game, fed, that though in times long ago they were covered with heavy forests, they seemed to have lost their ability to sustain any large amount of timber. Only near the banks of streams was there any considerable growth of trees, and these, in some sections, only the comparatively worthless cottonwood. But this deficiency will soon pass away. Encouraged by the Timber culture act of Congress, and by the desire to produce

trees instead of sending great distances for lumber, millions of trees have been planted, largely of the rapidly growing kinds, as the ailantus, locust, Osage orange, etc.; and even on the alkaline plains they are growing and thriving, and have already increased to a sensible extent the amount of the scanty rainfall. But only a portion of the region lying between the Mississippi and the Rocky Mountains can be called treeless. In Minnesota, Dakota, Montana, Missouri, Arkansas, parts of Texas and the Indian Territory, there are vast tracts of heavy timber, and the lumber exported from some of these States forms a very considerable portion of their productive wealth. West of the Rocky Mountains there is generally no lack of forests, especially on the mountain slopes; Utah, New Mexico and Arizona are, however, but sparingly supplied with timber, and much of the land suffers from drought except where irrigation is possible. On the Pacific slope, portions of California and Nevada, all of Western Oregon and Washington are remarkable for the gigantic height and bulk of their forest trees. The Redwoods and Sequoias, which range from 300 to 475 feet in height, are not the only giants of these forests; several species of pine and fir and some of the cedars tower from 250 to 350 feet in height on the lower hills of the Coast range, in California, Oregon and Washington. In Eastern Washington and Oregon there are extensive, elevated plains, without much timber, which are very cold in winter and intensely hot in summer. In Wyoming and Colorado the mountains are generally clothed with forests, up to a point somewhat below the snow line; but the plains, plateaux and foothills are very often devoid of trees, except along the water-courses, or where they have been planted by man.

Over much of this vast territory, nearly all of it beyond the Rocky Mountains, and the alkaline plains east of that range, there is little or nothing which can be called *sod*; the long, dry summers would destroy it if it existed. But the buffalo and gramma grasses, more nutritious than our cultivated grasses, are adapted to the summer drought, and furnish all the year round a most delicious pasturage for cattle. The bunch grass, and the white sage-brush (after frost), are eagerly cropped.

Wherever, as in California, Nevada, and portions of New Mexico, the cultivation of grasses for feeding cattle has been found desirable, the Alfalfa grass, a species of South American lucerne, which yields two or three enormous crops a year, and is admirably adapted to this climate, furnishes at small expense a succulent and nutritious food for cattle and sheep. There are also other forage grasses, most of them native to the coast, which amply supply the absence of our sod-making grasses in the Atlantic States.

In the season of melting snows, and moderate rains, these desolate and dreary plains are resplendent with flowers of every hue, and many of them redolent of the sweetest perfumes.

The root crops of this entire region are remarkable alike for their abundance, the great size they attain, and their excellent quality. In the deep, rich, and easily penetrated soil of all these States and Territories root crops seem to run riot, and grow without stint. The common potato, the sweet potato and the yam, yield from 400 to 600 bushels to the acre, and are, perhaps, the most profitable crops which can be raised. Turnips, both yellow and white, carrots, beets, etc., yield fabulous quantities of such gigantic size that they are hardly recognizable. The whole melon tribe, including the pumpkin, squash, and cucumber, as well as the watermelon, muskmelon, cantelope, and citron-melon exhibit their greatest fertility and most abundant productiveness in the most arid and desert-looking of these lands. Arizona, Southern California, the southern part of New Mexico, and Western Texas, are peculiarly adapted to these creeping vines and their cooling fruits.

This Great West is destined to be the garden of the world, in its cultivation and conservation of edible fruits and their products. Its great variety of climates and temperatures, and the elevation of its arable lands, even in semi-tropical regions, permits, and will continue to permit and demand, the production of the greatest variety of choice fruits to be found in any one region on the earth's surface. In the northern portion, the apples, pears, quinces, plums, cherries, and small fruits of Minnesota, Dakota, Montana, Idaho, Washington, Oregon and

Northern California are unsurpassed either in size or flavor by those of any other part of the world. It has been asserted that the larger fruits of California, as well as its vegetables, though of great size, lack the succulency and fine flavor of those raised in the Eastern States, but there is no reason to believe that this is true. Fruits carried to great distances from their native soil, and kept for months or years, do lose something of their flavor, as is well known; but eaten where they are grown, they are unsurpassed in excellence. The belt below this, consisting of the States of Iowa, Missouri, Southern Dakota, Kansas and Nebraska, Wyoming, Northern Colorado, Utah, Nevada and Central California, adds to this list the peach, the apricot, and, above all, the grape. Already California is more largely engaged in the culture of the vine than any other country in the world. Every known species and variety which possesses merit is grown there, and though her great vineyards are so young, she is only second to France in the amount of her wine production. Nowhere can finer "raisins of the sun" be produced than there. Her peaches are excellent, but not so much attention has been given to their culture, as in other regions.

The whole belt of States and Territories we have named are capable of a like development in viniculture with California. Their grapes may have a slightly different flavor, and the wines produced from them may be as distinguishable, by the cultivated taste of the connoisseur, as those of Tokay and Xeres or Rheims; but they will be in as great demand as the wines of the Californian vintage.

Farther south, in Arkansas, the Indian Territory, Texas, Arizona, Southern New Mexico, Southern Utah and Nevada, and Southern California, sub-tropical fruits abound—the orange, lemon, lime, fig, olive, pomegranate, banana, guava, Madeira nut, pecan, and the finest and most luscious varieties of the peach, are some of the treasures which Dame Nature lays up for her children in the sunny South. There are also many native fruits and nuts, less widely known, but not less delicious or grateful to the taste, than those we have named, to be found in the forests of the Great West.

CHAPTER IV.

WILD ANIMALS AND GAME—BEASTS OF PREY—GRIZZLY AND OTHER BEARS—
 MR. MURPHY'S GRIZZLY BEAR STORY—THE COUGAR, PUMA, OR PANTHER—
 THE JAGUAR AND OTHER FELIDÆ—LYNXES—THE MARTEN AND WEASEL TRIBE
 —THE GRAY WOLF—THE COYOTE—AMPHIBIA—THE WHALE TRIBE—BIRDS
 OF PREY—PERCHERS AND SONG BIRDS—PIGEONS AND GROUSE—WADERS AND
 SWIMMERS—REPTILES—FISHES—MOLLUSKS AND CRUSTACEANS—DOMESTIC
 ANIMALS.

MANY of the wild animals of our Western Empire are peculiar to that region. The Bison or American buffalo, whose range extended originally from the Rocky Mountains to the Appalachians, has for these many years past been only found west of the Mississippi, and as settlement and civilization advanced westward he has been driven back to the plains and foothills of the Rocky Mountains, a tract of not more than three hundred miles in width, and perhaps twelve hundred in length from north to south, and even this was encroached upon every year by the new towns springing up all along the line. Since the advent of railroads, crossing these plains, the number of bison has rapidly diminished. Many thousands were shot from the cars for fun, and left to die on the plains; hunters destroyed tens of thousands for mere sport. More than as many more were slaughtered for the hams and tongues, and the Indians killed from one to two millions annually for the flesh, and the robes or skins. It is estimated that within the past ten years, not less than twenty millions of these noble animals have been slain, and that hardly more than 300,000 remain. The bison is not found west of the Rocky Mountains.* The moose, though plentiful in British

* Colonel Richard J. Dodge, United States Army, a famous hunter, speaks of another species, or at least a well-marked variety of the buffalo, known to hunters as the mountain or wood buffalo, or "the bison." It has shorter but stouter legs than the common buffalo, is very shy, and by no means plentiful even in its chosen haunts, and inhabits only the deepest, darkest defiles and cañons, or the craggy and almost precipitous sides of mountains, from which it will not depart, while its congener prefers the plains. Except in one instance, no sportsman has bagged more than one, but its existence is well vouched for, though, so far as we are aware, it has never been described by any other writer.



ROCKY MOUNTAIN GOAT, ELK, RED DEER, BLACK BEAR, FOX, MOOSE, WOLF, PANTHER,
GRIZZLY BEAR, COYOTE, PRAIRIE DOG, WILD CAT, BUFFALO, WILD HORSE.

Columbia and Alaska, is only found in the region in the northern part of Washington Territory, in Northern Idaho, and Montana.

The Elk, the next largest of the game animals east of the Rocky Mountains, has nearly the same range as the Buffalo, though it usually seeks the vicinity of the river valleys. It is less abundant than the bison, but has only partially escaped the indiscriminate slaughter to which those unfortunate animals have been subjected. They are often found in large numbers (three or four thousand it is said) in the great parks of Colorado, and in Montana.

There are three species of deer, the black-tailed, white-tailed, and mule deer; and at least one species of antelope, a graceful, beautiful creature. West of the Rocky Mountains, there is a representative of the Ibex family in the Bighorn or mountain sheep, and one of the goat family—the wild Rocky Mountain goat, which may, perhaps, be allied to the goat antelopes of the Himalaya Mountains. Of smaller four-footed game and rodents, there are six or eight species of hare and rabbits, one bearing the name of the Jackass rabbit, from the enormous length of its ears; the beaver, musk rat and mammoth mole; squirrels of ten species, five of gophers or prairie dogs, the yellow-haired porcupine, four species of kangaroo mice, the usual variety of moles, rats, mice and dormice.

Of beasts of prey there are a considerable number, and some of them formidable in size and strength. There are probably two species, and possibly three, of bears east of the Rocky Mountains: the black, the cinnamon, and a smaller brown one, known as the Mexican bear.* The bear is omnivorous in his diet; ants, grubs, mice, moles, squirrels, rabbits, eggs, berries, grapes and fruit, all seem alike to him, but if he has a special vanity, it is for honey. He does not attack man unless in extreme hunger, or in protecting the cubs; but if attacked makes a very stubborn fight, especially at close quarters. His claws are very sharp and strong. Beyond the Rocky Mountains the formidable and somewhat ferocious grizzly bear, the largest American plantigrade, except possibly the Arctic or white bear,

* Some practical zoölogists contend that these are not different species but simply varieties.

is added to the number. The black, brown, and cinnamon bears usually avoid a conflict with man unless attacked, when they fight fiercely. It is said that among the miners of Western Colorado, a class of men not lacking in courage or pluck, when some new-comer, ambitious to show his prowess, proposes to go out and hunt the bears, which are very numerous there, the shrewd old miner, who is well versed in bear nature, will reply: "Guess not; I haven't lost any bear." The grizzly bear, especially if hungry, is not wont to wait for a provocation to a fight, and he possesses so thick a hide and so much vitality, that it is very difficult to disable or kill him by even two or three well-aimed shots. When wounded his rage is fearful, and his long and strong claws enable him to make very short work of an antagonist who comes within reach of them.*

The cougar, puma or panther, sometimes called the American lion, is another very formidable animal; somewhat smaller than the African lion or the Bengal tiger, it has as much ferocity and almost as much strength as either. It is, however, cowardly like

* Mr. J. M. Murphy, in his "Sporting Adventures in the Far West," devotes one chapter to the grizzly bear, and relates some very humorous stories of experiences in hunting it. Formidable and ferocious as it is, the grizzly is terrified by the human voice, when loud yells and cries are uttered, and will run away at once. Mr. Murphy says that a certain judge of San Francisco, who, while a good hunter and a capital humorist, was of somewhat intemperate habits, had engaged with a few friends to go out for a week's shooting among the grouse and quail, and was asked to be ready to join the party at a very early hour in the morning, so that a camping place could be reached in the afternoon. The night before starting he attended a ball and became so much intoxicated that on his way home he fell down several times in the mire, much to the detriment of his evening dress and opera hat. Just after reaching home the carriage came to take him to the rendezvous, and he insisted on going in the plight he was in. After some remonstrance he was taken as he was, and the party travelled to the mountains about forty miles distant, pitched camp and, building a fire, prepared for supper. A Spaniard approached them and said that there was a grizzly a few rods off in the bushes. The judge, who was dozing near the fire, roused up at once and said that he would go and bring it into the camp. His companions laughed at him and chaffed him, but his temper was roused, and seizing an empty shotgun, he said he would prove his assertion, and strode off into the shrubbery. In about twenty minutes there was a great commotion in the bushes, and all the party seized their guns and prepared for some unknown danger. In another minute the bushes parted and out came the judge without a hat, and running with such speed as to cause his hair and coat-tails to stand out at right angles to his body. As he approached, he shouted at the top of his voice: "Clear the track; here we come, *the bear and me*, confound our souls." They did clear the track, and the judge rushed through the fire and did not stop till he had run a good half mile to the rear. His companions stopped the bear and caused it to retreat by a few yells and shots, but the foolhardy judge was the butt of many a joke on his race with the bear.

“ME AND THE BAR’S COMING.”



all its tribe, and seldom or never attacks man except when very hungry or in defence of its young. When attacked it is a formidable animal, its strong claws and great muscular power giving it great advantage. It is, when full-grown, about four feet eight inches in length, exclusive of its tail, and weighs 150 or 160 pounds. It is an inhabitant of the forests, and rarely goes any great distance from them. The jaguar or American tiger is also found in Texas, Arizona, New Mexico and Southern California. It is a larger and perhaps fiercer animal than the cougar, but is nowhere abundant and is not found at all north of the thirty-ninth parallel. A smaller, but equally fierce and perhaps equally cowardly member of the feline family, is the catamount, ocelot, or tiger-cat,* while the wild cat, with its short blunt tail, and the lynx, of which there are three species—the Canada lynx, the bay lynx or red cat, and the banded lynx—complete the wild felines of the region. Of the marten tribe and its congeners there are many genera and species. The marten proper or American sable, the fitch marten, stone marten, wolverine or fisher, two species of skunk, the mink, the yellow-cheeked weasel, the otter and sea otter, the badger, raccoon; five species of fox, the raccoon fox or mountain cat. Next in order come the wolves. The American large gray, dusky or black wolf (all these distinctions of color being found in the same species) is a far less ferocious animal than his European congener; he is cowardly, and when attacked by dogs or men always tries to find safety in flight. There are not more than one or two instances known where these wolves have attacked a man, and then it was only when they were frantic with hunger, when a large pack of them were together, and when the man was carrying some game. They are great thieves, and will carry off lambs or sheep, pigs, calves or young colts, and when hunger has made them desperate, they will hunt antelopes, deer and even the buffalo. Their bite is very sharp, and they always endeavor to hamstring their prey, if it is a large animal. They are so destructive to sheep and young cattle that great numbers

* This name is also given by some to the Canada lynx, but improperly, as all the lynxes differ in structure from the true cats.

of them are killed by poison, usually by strychnine. There are a class of men in the West known as "Wolfers" who make a special business of killing wolves, and selling their pelts, which are valuable. This is a profitable business, but those who engage in it undergo great privations and hardships, and they very often spend their hard-won gains in miserable debauchery.

The coyote or barking wolf is an intermediate link between the gray wolf and the fox, and maintains about the same position in this country which the hyenas do in the East. He is a thief, and a mean, cowardly, vile-smelling thief, but he subserves one useful purpose—he is an indefatigable scavenger, though a very dirty and cruel one. He will dig up the bodies of the dead and feast upon them, and every animal that is wounded or sick falls a prey to him. If nothing better can be found he will prey upon chickens, rats, mice, moles, or any other of the small rodents. A pack of coyotes have been known to attack a wounded buck and strip every bone clean in ten minutes. They are often covered with sores from feasting on dead bodies. Colonel Dodge insists that the prairie wolf is not the genuine coyote, and that the coyote is a meaner animal found only in Texas.

The cetacea of the Pacific coast include the right and California gray whale, the hump-back and fin-back, two beaked whales, the sperm whale, black fish, walrus, and three species of porpoise. The amphibia are the sea elephant, three or four sea lions, two species each of seal and sea otter.

The birds of this vast territory number more than 500 species already described, and many more discovered but not yet fully described. There are twenty-five species of climbers, nearly two-thirds of them wood-peckers; more than forty species of birds of prey, including six of the eagle family, twenty hawks, buzzard hawks and falcons; twelve or thirteen species of owls; the king of the vultures, as large as the condor and the lammergeier; and the turkey-vulture or turkey-buzzard, so common in the South.

Of the perchers, fly-catchers, and grain-pluckers, most of them song birds, there are nearly 200 species; in the first group are included crows, ravens, magpies, jays, jackdaws and king-fishers;

in the second and third groups, fly-catchers, several species of humming-birds, swallows, wax-wings, shrikes, tanagers, robins and thrushes, wrens, chickadees, grosbeaks, finches, linnets, orioles, larks and sparrows.

The pigeon family have five or six representatives, including the California and the band-tailed pigeon, the ring, the turtle and the ground doves. There are probably two species of pheasant. The grouse family are numerous, and include blue grouse, ruffed grouse, the sage hen, which feeds upon the sage-brush of the alkaline lands and whose flesh though tender is very bitter; the prairie hen, at least five species of quail, two of partridges, and three or four species of ptarmigan. There are more than sixty species of waders, including cranes, herons, bitterns, ibises, flamingoes, plover, kill-deer, avocets, English snipe, jack-snipe, sand-pipers, curlews, rails, rice-birds, etc., etc. The swimmers are still more numerous, over one hundred species having been described, including many species of geese, which frequent the lakes and broader streams, brants, teal of at least a dozen species, as many of ducks, the canvas-back being found in great numbers in his best estate, scooters, coots, sheldrakes, mergansers, pelicans, cormorants, albatrosses, fulmars, petrels, gulls, terns, loons, dippers, auks, sea-pigeons, and murre.

The reptiles of the Pacific coast, and its rivers and lakes, differ from those of the States and Territories whose waters drain into the Gulf of Mexico. In the former there are no true saurians (alligators or crocodiles), except in the Colorado and its affluents; in the latter the alligator and probably the crocodile are found in great numbers below the thirty-fifth parallel. The Pacific States and Territories have five species of rattlesnake, and no other venomous snake unless possibly a viper; while the latter have as many species of the rattlesnake, and at least three other venomous snakes, and possibly more. There are about thirty species of harmless snakes, five of tortoises, seven or eight land turtles, terrapins, etc.; about forty species of lizards, and nearly fifty frogs, toads, horned toads, salamanders, proteuses, etc., etc.

There are more than five hundred species of fish, most of them

edible in the waters of the Pacific and the Gulf, and in the thousands of fresh and salt lakes, and the numerous rivers of this vast region. Among these are ten species of the Salmonidæ, native to the Pacific coast, besides several others now naturalized; the taking, packing and canning of the salmon forms one of the largest and most rapidly increasing industries of Oregon and Washington Territory; the rivers and lakes swarm with trout. Seven or eight species of the cod family, about twenty species of eels, ten of mackerel, and two of the bonita or Spanish mackerel, numerous species of the perch family and its congeners, the blue-fish, eight or nine species of bass, the lake white-fish (introduced); three species of tautog; one, the red-fish, a most delicious table fish; about twenty species of flat-fish and flounders; twelve species of shad, herring, anchovies, etc.; nearly thirty of the carp tribe, weak-fish, balloon-fish; and over forty of the cartilaginous fishes, sharks, rays, sun-fish, sturgeons, etc., etc. There are seventy-five species of mollusks.

CHAPTER V.

INCLUDING the Indians in the Indian Territory, the Pueblos in New Mexico and Arizona, and the Indians employed on ranches in California, Nevada, Oregon and Washington, and the tribal Indians on the plains and elsewhere, there are probably not less than 300,000 Indians of all races in the Great West.

These Indians are of many tribes, and their languages, habits and modes of life differ materially. A comparatively small number evidently belong to two of the races which preceded the North American Indian on this continent. The Pueblos of New Mexico, who are also found in small numbers in Arizona, have their name from their practice of living in towns or villages, *pueblo* being the Mexican name for a town or village. They live in adobe houses, cultivate the soil, and though in secret idolaters, are outwardly obedient to the priests, and devout Catholics. They are a quiet, patient, good-tempered race, evidently Aztec, and having no other affinity with the American Indians than their color and hair. There are several villages in Arizona,

New Mexico and Colorado, of the cliff-dwellers, or Moquis, a still earlier race, of which they seem to be the only survivors. Their dwellings are hewn in the perpendicular rocks of some *mésa* or *butte*, or crown its height, and are only accessible by ladders or rude rock stairways. Their cattle and sheep occupy usually only the top of the mesa, and here were constructed also large reservoirs for water, which they use for themselves and their cattle. They are engaged in manufactures as well as in agriculture, and their blankets, their cordage, their bread manufactured in thin sheets from the blue corn which they cultivate, their ornaments, etc., are very curious. They are as much advanced in civilization as the Peruvians of South America, and possibly belong to the same race.*

In the Indian Territory, the tribes removed thither from Georgia, Alabama and Mississippi, in 1832 and 1833, the Cherokees, Choctaws, Creeks, Chickasaws and Seminoles, have farms and good dwellings, and show no disposition to lead a nomadic life. Of the other fifteen or sixteen tribes or fractions of tribes, now occupying portions of the Territory, some are becoming accustomed to the herdsman's life and seem contented; others do

* Very few of our explorers or tourists have visited these singular and interesting people in their rocky fastnesses. Among the few are Prof. J. S. Newberry, now of the Columbia College School of Mines, and an eminent scientist, Colonel J. W. Powell, the pioneer explorer of the Rio Colorado, and General J. C. Frémont. They are certainly a much more intelligent and highly civilized people than any of the Indian tribes now existing on this continent, and in all probability are the remnants of a race which preceded the Aztecs, the inhabitants of Mexico when that country was first discovered. Their cliff dwellings exhibit remarkable architectural skill, and their religious ceremonies, of which Colonel Powell has given a most interesting account in *Scribner's Monthly*, while very singular, indicate their origin from one of the primitive races of Northwestern Asia. They are generally regarded as fire-worshippers, but like the Parsees, their worship seems to have been symbolical, and to have regarded fire and the sun, the great source of fire, as only the symbols of the creating and vivifying power which pervades all nature. Their manufactures were rude, but the products were of great excellence. We have ourselves seen a blanket, which Prof. Newberry obtained from them, woven from the wool or curly hair of their sheep or goats, and into which when suspended by its four corners, three pailsful of water were emptied, and after nearly a half-hour the under surface was not moist in the slightest degree. Their ornaments of gold, silver and copper displayed a high degree of artistic skill. Their bread, made from the maize of different colors, red, blue, yellow, white, etc., which they cultivate, pounded into meal in a mortar and made into a thin paste, when baked was no thicker than writing paper, each sheet being about fourteen by eighteen inches, and folded so that the pile of edible sheets resembled a ream of blue or colored paper. In these villages four or five languages are spoken, none of them bearing any known relation to those of the other Indians.

not take kindly to even partial civilization, and are restless and uneasy. This is particularly true of the Comanches, the few Apaches who are in the Territory, and some of the later comers, as the Cheyennes, Arapahoes and Poncas. The nomadic Indians, though of many tribes and languages, yet belong for the most part to four or five groups. The largest, most numerous, and most warlike of these are the Dakotas or Sioux, and the Shoshones, Snake Indians or Utes. In the former group are included not only the Unkapapas, Tetons, Crows, etc., but the Winnebagoes, Assiniboins, Omahas, Poncas, Ioways, Otoes, Mandans and Minitaris. Their hunting grounds extended from the Canadian line through Western Minnesota, Dakota, Montana, Western Iowa, Nebraska, and Kansas, and part of Wyoming, into Northern Colorado. Some tribes of this group have been almost constantly hostile to the whites, and have more than once perpetrated terrible massacres. The horrible scenes in Minnesota in 1862-3 were the work of the Crows, one of the tribes of this group. The butchery of Custer's gallant force was also perpetrated by bands of this group. Sitting Bull is the chief of one of the Sioux tribes. They have been very often at war with the Utes.

The Shoshones, or Snake Indians, very possibly outnumber the Sioux. They include not only the Shoshones proper, in Oregon and Washington Territories, but the Bannacks, Wihnasht, Comanches, Kizht and Netela, the Modocs, and the various tribes of Utes, the Pah Utes, Pi-utes, White River Utes, Uintahs, Uncompahgre Utes, etc. Ouray is a chief of the Uncompahgre Utes, and Douglas of the White River Utes. These tribes are found in Oregon, Washington, Idaho, Western Montana, California, Nevada, Utah, Wyoming, Colorado, and some of them in Northern Texas. Among the smaller groups are the Sahaptin or Nez Percés, under which name are included also the Walla Wallas, Yakimas, Pelouse and Klikitats of Washington and Oregon; the Selish or Flat-heads, under which name are included the Pend d'Oreilles, the Cœur d'Alenes, Spokanes, Piskous, Nesk'wally, Chehallish, Cowlitz and Killamooks or Tillamooks of Idaho, Oregon and Washington; the

Yumas include the Coco-Maricopas, Cuchans, Mohaves, Hualapais and Yavapais, and the Diegueños of Arizona; the Pimas include the Pima Apaches, the Coyote Apaches, and other Apache tribes, as well as the Pimas proper of Arizona and New Mexico.

The number of "colored persons of African descent" is not far from 700,000, there having been a considerable exodus of negroes from Mississippi, Tennessee and other Southern States east of the Mississippi into Texas, Arkansas, Kansas, and Nebraska.

The number of Chinese and Japanese now in all these States and Territories does not exceed 100,000 and perhaps not 75,000. It is more difficult to determine the number of persons of Hispano-American parentage, whether of the whole or half-blood, since, in Texas, California, Arizona, New Mexico, Nevada and perhaps also in Colorado, a considerable number were of such parentage, yet born in those States and Territories, before they came into possession of the United States. As nearly as we can estimate, these Hispano-Americans, whether born in our new States and Territories or in Mexico, must number somewhat more than 100,000. Of about equal number are the emigrants born in British America, who are mostly Canadian French, and in the Northwest, a considerable percentage of the trappers and hunters often of mixed blood, from the Northwest and Hudson's Bay Companies.

Asia and Africa and Australia contribute their several quotas, small ones, it is true, to make up the mixed multitude, from all lands, who have flocked hither within the past thirty years.

Probably somewhat more than one-half of the whole number were born in the United States, and of white American parentage. Except in the older States of this Western Empire, Missouri, Arkansas, Texas, Iowa, and California, and in a smaller degree, Minnesota, Kansas, and Oregon; very few of these citizens who have attained adult age, are native to this region, and "to the manor born." Every State of the Union has contributed its quota, the majority in the Northern and Central States and

Territories having come from New England and the Northern States, New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois and Wisconsin; while the emigrants to Texas, Arkansas, the Indian Territory, Arizona, New Mexico, Southern Colorado, and Utah, and Southern California, are very largely from the Southern and Southwestern States, though Southern Illinois has contributed a considerable share of the recent emigrants to Texas.

CHAPTER VI.

No such experiment in the blending of the different races of men into one homogeneous nation, has ever been attempted, on a scale so grand and extensive, as that now in progress in our Western Empire. Will it prove a success? Here we find the New Englander, intelligent and often scholarly, but almost always shrewd, sharp, and enterprising, cheek by jowl with the tall, lank, bilious-looking Southern, less enterprising, perhaps, yet equally sharp in his way, with a dogged energy, and often an irritable temper. The quick, nervous, impulsive, but capable New Yorker has for a partner a dreamy and apparently stolid German, who is, nevertheless, fully awake to business matters. The quiet but acquisitive Pennsylvanian is linked with a wild, blundering, impulsive, and jovial Irishman. Sprigs of British aristocracy and British snobs are found in all callings, from the highest to the lowest, and the mercurial Frenchman, the proud and haughty Spaniard, the dark-browed Italian, and the versatile Russian, are all found occupying, in apparent harmony, the same sod-house or dug-out. The Israelite is everywhere, and at all times ready to turn an honest penny. Far from dealing always in old clothes "shust as goot as new," he is a banker, a mine owner, a capitalist, or a landed proprietor. In the mining regions, especially, this commingling of different nationalities has led almost to a new nationality, certainly to a new dialect, at first almost unintelligible to the new-comer, but very speedily acquired by a few weeks' residence. Every man has his title, generally applied with considerable shrewdness and appropri-

ateness, but, except in rare instances, retained as long as he remains in the region. Very few rank as low as "Captain" or "Major," though the latter has some currency; but "Colonel" or "Commodore" are the most usual titles, while in a few instances, where neither the military nor naval appellation seems appropriate, a man is recognized as "Jedge" (Judge). "John Phœnix" (the late Lieutenant G. H. Derby) gives a laughable illustration of this practice, almost thirty years ago, in California, where he relates, that going on board ship, for the long return voyage round the Horn, and being very much depressed from the fact that he had no friends to accompany him to the ship, and wish him "*bon voyage*," as all the rest seemed to have, he at last, just as the ship was moving off, lifted his hat in desperation and called out to some make-believe friend in the crowd on shore, "Good-bye, Colonel." In an instant, he said, hundreds of hats were in the air, and the shout rang out in reply from hundreds of throats: "Good-bye, Colonel." But the slang expressions of this mining dialect are too numerous to be recorded. New-comers are "Tender-feet;" a dead man has "passed in his checks;" one who has been killed in a brawl or street-fight "died with his boots on." A man who is both liberal and just, "pans out well;" one who has excited the displeasure of his "pards" (associates or fellow-workers) is "off color." If a man shows pluck or grit under adverse circumstances he "has got sand." Earth or gravel containing considerable free gold is subjected to the "panning" process, with good results. A vein of gold or silver, yielding largely at first but gradually becoming smaller as the rocky walls come closer together, is said to "peter out," and a man of large pretensions, but of gradually diminishing performance, has the same epithet applied to him. A ravine is a "gulch;" a pool of water at the bottom of a mine, a "sumph."

Bad whiskey is "*tarantula juice*;" prospectors who are ignorant of their business and disposed to grumble are "*gruber-grubbers*;" and when they make a precarious livelihood from what game they can kill with old squirrel rifles, they are said to "live on *snaaps*," the snaps of the rifles which did not bring down any game. A new-comer speaks of the large-heartedness of

some of the miners he has met, and the reply is: "Yes, there's a good many of them big-hearted fellers in this country. You see them small-souled cusses *takes too much irrigation to bring 'em out*. They've just got to git up and git." The word "irrigate," which in this expression has manifest reference to the results of irrigation in producing immense crops on the arid lands, has also another signification in the West. "Stranger," said a rough-looking miner to a clerical-looking gentleman, in one of the Concord coaches, "do you irrigate?" producing at the same time a bottle. "If you mean to ask whether I drink, sir, I do not," was the dignified reply. "Stranger, have you any objection to our irrigating?" was the next question. "No, sir," was the reply. After the irrigation had been completed, the miner, who afterward turned out to be a large mine-owner, propounded a second question. "Stranger, do you fumigate?" "If you mean to ask do I smoke, sir, I do not." "Well, stranger, do you object to our fumigating?" "No, sir; certainly not," was the prompt reply. It should be added to this story that at their journey's end, when the clergyman, a day or two later, called for his hotel bill, he was told that it had been paid by the miner, who had thus manifested his respect for his manly refusal to indulge in drinking or smoking.

This mining and herding dialect seems to be a conglomerate in which many Spanish and Mexican words are mingled with Indian terms, Chinese "pigeon-talk," Chinook, Eastern and Southern Americanisms, and perhaps mining terms and phrases from Great Britain and the continent. It is astonishing that a dialect, so utterly void of rules or system, can be acquired so rapidly. In one-tenth the time required for the acquisition of any regular well-organized language, any one will acquire this outrageous dialect and become thoroughly proficient in it.

The herdsmen and shepherds, and in many cases their employers also, are as rough as the miners in their language and dress. It is not uncommon to find among these rough, unkempt and mud-bespattered men, graduates from our Eastern universities and colleges, men who have enjoyed all the amenities of the most refined society, but who, discarding all conventionalities,

have chosen to live thus roughly and uncouthly. In some instances sons of English peers, themselves graduates from Oxford or Cambridge, have followed the same course. A correspondent of the New York *Tribune* relates that he found in Leadville, in a building, half tent and half shanty, occupied by a miner and his family, a Steinway grand piano, perfectly in tune, a choice and well-selected library, and both in charge of a lady as refined and accomplished as could be met with in the best circles in our great cities, and these luxuries of civilization had been brought thither when the freight by ox or mule-team from the nearest railroad station, then eighty or a hundred miles away, was fifty cents a pound.

Among all classes the American fondness for humorous exaggeration crops out. A miner will tell a stranger, with a perfectly serious face, that a mine of very small promise has "millions in it," and perhaps in the next breath, examining a choice specimen of ore, he will throw it from him contemptuously, declaring that it won't yield more than 110 per cent. of pure silver. He will describe to another, with a face beaming with pity, "how discouraged the miners were, because they had to dig through four feet of solid silver before they could get at the gold;" or when the large yield of silver is spoken of, he will say: "Pshaw! that is of no account; there is a man down in Iowa that has invented a process for making silver for fifty dollars a ton; so that is no good." This same tendency to exaggeration is sometimes acquired by our English cousins after a short residence here. "Haven't you any larger happles than those here?" inquired a cockney tourist of a market woman in Washington market, New York, pointing to a huge watermelon. "Can't you do hany better than that?" "Happles!" retorted the market woman, herself of English birth. "Hanybody would know you was Hinglish. Them hain't happles; them's huckleberries!"

The farmers are not as rough or rude in their mode of life as the herdsmen, shepherds or miners; though at first, on the frontier, the luxuries of society, whether in habitation, equipment, dress, or table fare, are neglected, and only the necessities of life are sought.

Yet it is the testimony of ladies of the highest character who have penetrated into these mining hamlets, or the sheep or cattle ranches, that nowhere in the wide world have they been treated with more courtesy, deference and respect, than among these apparently rough men. Miss Isabella L. Bird, an English lady of high social position and adventurous spirit, whose "A Lady's Life in the Rocky Mountains" is a most charming record of actual adventures in Colorado, found that even a noted outlaw and brigand, known as "Rocky Mountain Jim," manifested in his conduct toward women, the intelligence, chivalry and refinement of a gentleman.

In almost all the States and Territories of this western region there are numerous colonies, where a body of settlers, bound together by the ties of common race or nationality, community of religious faith, the desire of prosecuting a common avocation or pursuit, or, in some instances, from mere neighborhood, or general similarity of views, or from being natives of the same State at the East, have purchased a tract of land in common, and founded a colony, or settling on adjacent lands by mutual agreement, have become helpful to each other, and thus enjoyed the advantages of a colony without the difficulties incidental to a colonial organization. Many of these colonies have proved very successful, a few as conspicuously unsuccessful. Four or five adopted at first the principle of a community of lands, and perhaps of goods, but all or nearly all have subsequently abandoned it. In the regions where irrigation is required, some of the colonies made their canals and ditches the property of the whole colony, and each individual who used the water paid a water-rate; others had them constructed by a company, and those who used the water paid toll. Of the colonies on a secular, and partly, perhaps, on a political basis, the most successful have been the colony of Greeley, in Colorado, founded by the lamented Meeker, and its almost as prosperous neighbors, Longmont and Evans. In Minnesota there have been many Scandinavian colonies founded, Swedish, Norwegian, and Danish, and these often so near each other as to make considerable tracts Scandinavian in character, and for a time in speech. These colonies

have gradually extended into Northeastern Dakota. The Norse element is an excellent one in our country, for the Scandinavians are a hardy, frugal, industrious, and thrifty people. In Iowa, Southern Minnesota and Southeastern Dakota, as well as in Nebraska, there are many German colonies, generally of an excellent character. In Southeastern and Northeastern Dakota, as well as in Manitoba, and still more in Kansas, the Mennonites, a religious denomination already known in the Atlantic States, Russian by birth, but of German origin, have settled in large colonies, and form a valuable addition to our farming population.* In Dakota, and perhaps also in Kansas, they have been accompanied by other religionists of somewhat similar views, but of Slavonic or Russian origin. These call themselves simply "Christians," but are known to the Russian government as either *Molokani* or *Stundisti*. These have settled on lands adjacent to the Mennonites. In some of these States and Territories there are also colonies of Bohemians (Czechs), of Moravians, and we believe also of Tyrolese and Swiss. In Southeastern Dakota, Nebraska and Kansas there are also many colonies of English and Scotch, mostly farmers, though some are artisans. Kansas has one, and perhaps more than one, French colony, where silk culture and the manufacture of silk has been carried on, though, while awaiting the growth of the mulberry, and sufficient work for their filature, they have turned the silk mill into a cheese factory. There are also French and Hungarian colonists engaged in viticulture in California. A considerable colony of Japanese came to California some years since to engage in the culture of tea, and perhaps some other Japanese products, but we have no recent intelligence of their success.

In Colorado, New Mexico, Arizona, Nevada and Utah there

* Mr. H. J. Van Dyke, Jr., writing of these Mennonites in their Manitoba settlement, says: that an innkeeper at Winnipeg stoutly insisted that they were "no good." On being asked his reason for such a declaration, he still persisted that they were of no account. "Are they not industrious?" "Ye-es." "Are they not thrifty?" "Ye-es." "Don't they pay for what they buy promptly?" "Ye-es. But I'll tell you, when they come here, if any of them want to drink, every man pays for his own liquor. They never treat the crowd. I don't think they are of much account." The innkeeper's reason would seem to be decidedly creditable to the Mennonites.

are many associations for mining purposes, composed entirely of English or Scotch capitalists, employing almost exclusively British miners, and having their principal offices in London. In Colorado, Wyoming, Montana, and Texas, there are also British associations engaged in the stock business. In Utah, where almost three-fourths of the population are Mormons, and most of them believe in polygamy, while several thousands of them actually practice it, the Mormon immigration is almost wholly from Great Britain, though a small number come from the Scandinavian countries. As most of these immigrants are practical polygamists, our Government has recently sought to restrain the influx of such open violators of our laws. In New Mexico the greater part of the inhabitants, certainly nine-tenths, including both the original inhabitants and the immigrants, are nominally or really members of the Roman Catholic Church. The policy of our Government is, and has always been, opposed to the entire control of a State or Territory by one sect or denomination alone, inasmuch as perfect freedom of conscience, except where it violates the rights of others, is the cardinal principle of our national Constitution. Where one sect is largely dominant in a State or Territory, the rights of the minority are almost invariably invaded. In Utah this predominance involves also the practice of polygamy, which is an added violation of our national laws; and in New Mexico the school moneys derived from the sale of school lands have been misdirected by the Jesuits and other religious orders, who have the entire control of education there, not only to the payment of teachers of theology in Roman Catholic seminaries, but to the payment of the board of students of theology.

So far as colonies of Roman Catholics are concerned, they are perfectly right and proper, and very considerable settlements have been organized under the auspices of bishops and archbishops, in Dakota, Nebraska, Texas and Oregon, and perhaps in some other States and Territories. No objection is made to the organization of Mormon colonies, provided they obey the laws; and, as a matter of fact, the Mormons have planted large colonies in Idaho, and smaller ones in Colorado and Arizona.

In a few instances colonies of American Protestant denominations have settled in a single township, and have done well. There are Episcopal, Presbyterian, Methodist and possibly Baptist colonies of this sort. Generally, however, our American colonists prefer a diversity of religious beliefs in their settlements.

Recently, two methods of settlement and improvement of lands have been adopted. They are both of doubtful expediency, so far as the future of the States and Territories is concerned, though of great present profit and success in the development of new regions. The first method has been largely practised in California, and is coming into vogue in the newer States and Territories. A capitalist, usually, though not always, a practical farmer, stock-raiser or mining operator, or sometimes an association of capitalists, acting by their superintendent or general manager, purchases a large tract of land, often many thousands of acres, adapted to his purpose, whether of raising grain, wine-making, stock or wool-growing, or mining, erects the necessary buildings, and procures the best and latest machinery for his purpose, and hires his laborers, who may be the poorer classes of foreigners, Mexicans, Indians, or Chinese, and works his estate exclusively, or almost exclusively, with such labor, his machinery or steam-driven agricultural implements supplying the place of very large numbers of laborers. If he is a farmer, and in the smooth prairie lands, he breaks up the soil with his gangs of steam-plows, or an army of plowing machines each drawn by four horses or mules; sows his wheat or other grains with steam or four-horse drills; irrigates his lands, if irrigation is necessary, by water raised from an artesian well, by steam or wind-power; reaps, gathers and binds or more expeditiously still, clips off the heads of the grain and deposits them in an accompanying wagon by bushels, whence they are transferred by a chute to the threshing-machine, which threshes, winnows, separates and sacks the grain with little human intervention. When the market is at its highest point, he sends to it his hundred thousand or two hundred thousand bushels of wheat, his oats, barley, and corn in nearly equal amounts, and employing cheap labor, his net profits on a single year's crops may be reckoned by the hundred

thousand dollars, though his cultivation may be less thorough, and the yield per acre smaller, than on smaller and more carefully tilled farms. All this is very well for the capitalist, and equally well for the exporter of grain; but it is not so well for the State or Territory, nor for its permanent and successful development. These large estates prevent the formation of villages and towns, and the establishment of primary and grammar schools; encourage absenteeism, and tend to the establishment of a privileged and oligarchical class; and in the not distant future, when the public lands and the railroad lands are all sold, will bring about a condition of things such as now exists in Great Britain, and sooner than there, because the cultivation is more superficial and the land, skinned for present crops, will soon lose its fertility. It is a significant fact in this connection, that on the great "Dalrymple farm" in Northern Dakota, with its more than 30,000 acres in grain, the yield per acre is much less than that of adjacent small farms, and that the yield per acre diminishes with each successive crop, though the land is the best in the Red River valley.

The great cattle and sheep ranches are in some respects still more objectionable, inasmuch as the herdsman's life has a strong tendency towards a condition of semi-civilization. The owner of these immense flocks and herds may be, indeed, like the Oriental patriarchs, a man of culture and refinement, a poet or historian, a king among men, and may surround his children with all the luxuries of civilization; but his herdsmen or shepherds, without opportunities of education, and far from civilizing influences, will, in the course of time, become mere boors and hinds. In the wasteful methods of stock-raising in these regions, it is estimated that it requires fifty acres of the mountain pasturage to feed a single steer, and where the herd amounts, as it not unfrequently does, to 4,000 or 5,000 head, it may require a whole county to furnish them with sufficient pasture. This isolated life inevitably leads to results, directly opposed to the whole genius of our institutions. In the sale of the public lands, the policy of the government has been, to have the holdings small, and the settlers within such neighborhood to each other, that schools, churches, and villages, could be maintained; this

has been, to some extent, also the policy of the land-grant railroads, though those holding large grants have too often departed from it; but the pressure to sell large quantities of grazing lands, and in some instances farming lands also, has been so great, that the government officers and the railroad officials have too often yielded to it. In Texas, Arizona, New Mexico, Nevada, and California, the old Spanish and Mexican land-laws have prevailed, under which a square league of land was about the smallest parcel put upon the market, and from six to thirty leagues not an uncommon purchase. California is already suffering from these immense estates.

Another plan now prevailing to some extent, especially among the English middle classes, people of fixed incomes which terminate with their lives, is perhaps less objectionable though tending in the same direction. These people, younger sons of the nobility or gentry, retired army or navy officers, clergymen or their families, civil servants, etc., come to the western country and purchase one or two quarter sections or more, have them broken up, and perhaps a log-house or sod-house built, and let them, the first year for half the crop, and in the years that follow for \$1.25 to \$1.50 per acre. If their means are sufficient, they repeat this process, every year, till they have 2,500 or 3,000 acres leased in this way, and this gives them a comfortable annual income. This is less objectionable than the purchase of large tracts, because these quarter sections need not be contiguous, and there will thus be an opportunity for sufficiently close settlement to permit the establishment of good schools and villages; and these land-holders may sell their improved farms, at prices which will permit them to make still larger investments; but there is a strong tendency, in the process, toward the formation of a landed aristocracy.

CHAPTER VII.

VARIETY OF SOILS AND SURFACE—GEOGRAPHY AND GEOGNOSY—SOILS—GEOLOGY—CHARACTERISTICS OF THE ROCKY MOUNTAINS—VOLCANIC REMAINS OF THE YELLOWSTONE COUNTRY—THE GEYSERS—THE VICINITY OF SALT LAKE—PROFESSOR GEIKIE'S SUMMARY OF THE GEOLOGY OF THE CENTRAL REGION—MINERALOGY.

THE variety of soils in this vast region is almost infinite, and in this chapter we can only glance at the principal causes which lead to such diversity. There are nearly 2,000 miles of coast, washed by the ocean and gulf on the Pacific and in Texas, upon all of which has been cast by the waves, sand and alluvium to a greater or less breadth, for thousands of years. The very heavy rains on the west coast and the western slope of the Coast range, aided during the glacial epoch by the movements of the huge glaciers, the largest by far which ever existed on our earth, disintegrated the rocks, and washed down upon the foot-hills their constituents, varying according to the nature of the rocks, and varying also in the fineness of their comminution, in proportion as they were for a longer or shorter time ground by the slow but irresistible motion of the glaciers. The same causes produced similar effects, in the early periods, on both the eastern and western slopes of the Sierra Nevada and the Rocky Mountains. The great but now elevated valley between those two mountain chains, as well as the greater part of the plains east of the Rocky Mountains, were for ages the bed of immense lakes or inland seas, while the southern portion of California and Nevada connecting with the Pacific, through the Tejon pass, which was then another strait of Gibraltar, formed an American Mediterranean, where there is now only a desert. The upheaval of the bottoms of all these salt or fresh lakes, led to their drainage, by the Colorado and its affluents, the Rio Grande, the Arkansas, the Yellowstone, the Missouri and the Snake rivers. Most of these rivers, and pre-eminently the Colorado and its tributaries, cut their way through the soft and disintegrating rocks which formed

their beds, to such a depth as to make their channels deep cañons, sometimes from 3,000 to 6,000 feet below the surface of the plateau, through which they had their course. The plateaux were thus robbed of all their rainfall, and in the course of time, became dry and largely uninhabitable, and what was once a populous region, with its large and strong cities, was changed into an arid and desert land.

In some portions of these elevated plains thus drained of their moisture, the surface of the earth is covered, especially during a long, dry season, with alkaline salts, sulphate of soda and potassa, sulphate of magnesia, common salt, and occasionally baborate of soda, the *borax* of commerce. On these lands, in their natural condition, there grows only the despised sage-brush. In the rare instances where springs are found, the water is apt to be brackish.

Yet these alkaline lands, when broken up by deep plowing and well irrigated, yield most astonishing crops, and continue to do so year after year, while, by cultivation, the rainfall is increased, and the barren land becomes as the garden of Eden.

Where irrigation is impossible, and the amount of alkali is excessive, these lands are yet of some value for grazing, and the white sage-brush, once regarded as the most worthless of all shrubs, is found to yield a nutritious pasturage for cattle, after the frost has touched it.

Farther south, on what is known as the *Llano Estacado* or "staked plain" of Northwestern Texas and New Mexico, that remarkable product of a dry country, the mezquite tree, is found in abundance, and its large and long roots (nine-tenths of its woody fibre being below the surface), its trunk, its leaves, its bark, and its gum are all valuable. Where these lands are broken up and plowed deeply, the roots of the mezquite aid in bringing up the moisture from below, and the rainfall increases from year to year. Eventually all these alkaline lands, or nearly all, will be brought under cultivation, and will prove, either with or without irrigation, some of the most productive and valuable lands of the West.

The soil of "the plains," under which general term is included the territory lying west of the Mississippi, and especially west

of the Missouri river, and extending to the Rocky Mountains, is, with some exceptions, very rich and permanently productive. The region lying between the Mississippi and Missouri rivers is not properly a plain or plateau, for there are considerable ranges of mountains though of no great elevation. In some parts of it, as in Minnesota, Iowa, and Eastern Dakota, the prairies or gradually rising plateaux predominate.

But the "plains" proper include Southern Dakota, below the Black Hills, Nebraska, Kansas, Eastern Colorado, Wyoming Territory, and most of Texas. There are some "Bad Lands," though only a few small tracts in this region; but the greater part of it is an alluvium of extraordinary depth, ranging from five to one hundred and fifty, and in some cases two hundred feet. For ages this region was the bed of vast fresh water lakes, and received from the streams rushing down from the Rocky Mountains, vast quantities of loess, the debris of the decomposed rocks. Gradually it was upheaved, and the bed of the lakes became marshes, their waters being drained off through the Missouri and its affluents, the Platte, the Arkansas and Red rivers, and the Rio Grande. The process of slow upheaval still continuing, these marshes, which had been continually enriched by the silt from the overflow of the rivers, and by the decay of vegetation for thousands of years, became dry land, and land of unexampled fertility. The fires kindled in their grass and forests by roaming Indian tribes, prevented the growth of forest trees, over large tracts of this region, and so diminished the rainfall; while the countless herds of buffalo in their headlong tramps southward, beat the soil down into a solid and impenetrable crust, which permitted the rainfall to run off without soaking the earth. Without breaking up this solid crust, successful cultivation was impossible. With it, the crops were so bountiful as to astonish the most sanguine.

Texas, having a more varied surface, has also a greater variety of soils than any other of the States or Territories, with the possible exception of California. The coast soil is a sandy, grayish loam, well adapted to cotton and rice, and, where darker and richer, the best sugar land in the United States. The river

bottom lands are black, rich and sticky at times, and form the best cotton land in the State. Sometimes small tracts lack either the phosphates, or sulphates, or both; and crops will not grow on them. These are known as "poison soils." A dark, gray soil, in the timber lands, is found excellent for all kinds of fruits; this is sometimes called the mulatto soil. The deep red soils, containing some oxides of iron, are also well adapted to fruit, and to grains generally. The chocolate soils of Western Texas are, perhaps, the finest in the State, producing cotton, corn and semi-tropical fruits. The sandy and dryer soils of the north, even on the lands adjacent to the Staked Plains, yield, with deep plowing, very large crops of wheat. Wheat is also a good crop on the red soil.

There are, of course, barren soils in these States and Territories, though many of those which are so regarded need only irrigation and deep plowing to make them abundantly productive.

The details of the geological structure of this vast region, if they were attainable, would fill many volumes, for we have every form of cosmic and geologic action represented here which has taken place in any part of our globe—among which we may name the tertiary and alluvial and diluvial deposits which have been made on its 2,000 miles and more of coast line during their alternate elevations and depressions; the upheaval of the lofty mountain ridges from the broad and level plains; the effects of former extensive volcanic action, and its remaining, though comparatively enfeebled, activity at various points. Then, too, there are the great phenomena of glacial action, on a scale much vaster than that of any existing glaciers; the huge horse-shoe-shaped moraines, in some cases filling up valleys, in others producing large lakes; the erosions produced from the ice streams of these glaciers, and from the mountain floods, and the broken barriers of some great lakes; the depressions produced by earthquake convulsions, and the exposure of horizontal strata of great thickness of the Cretaceous and Carboniferous formations, where the sharp plough of the glacier had cut its way, or the force of the mountain torrents, of great volume, had worn their deep cañons through them.

The grand outlines of its geologic structure which we have thus formulated show conclusively that, if the science of geology had had its birth in this great empire of the West instead of the comparatively limited formations of Western Europe, we should have had a system, which would have required fewer additions and accommodations, to fit it to represent the geological structure of all the continents, and many of the questions, which even now vex the souls of scientists, would have received their final solution.

Considerable portions of this vast region have never been explored geologically, except by a very superficial reconnoissance at distant points; among these are Texas and most of California, Washington Territory and much of Utah, Nevada, Arizona and New Mexico. The first three seem to have geological features peculiar to themselves, to which we may allude more fully when speaking of them individually. The geological structure of the more central States and Territories, and the effects of glacial action upon them, are very admirably summarized in a recent lecture of Professor Archibald Geikie, the eminent Scottish geologist, who visited them in 1879, portions of which we quote:

"He had," he said, "three objects in the expedition—(1) To study the effects of atmospheric agencies and of erosion generally upon the surface of the land; and there was no region where those lessons could be learned with more powerful impressiveness than in those great plateaux and table-lands. (2) To study the relation which the structure of the rocks underneath bore to the form of the surface. In this country and in Europe generally one was continually brought face to face with evidence of dislocations, profusion of igneous rocks, faults and so on, which greatly complicated the geological structure, and made it sometimes by no means easy to tell how far the present irregularities of the surface were due to unequal waste of surface, and how far to the direct effects of underground causes. The western regions of America which retained to this day for thousands of square miles the horizontality which they had originally, presented wonderful facilities for the discussion of this subject. (3) To watch with his own eyes some of the

last phases of volcanic action. He had been familiar with these as displayed in Italy and in the Lipari Isles; but he was anxious to see some of those marvellous evidences of the gradual wearing and decay of a vast volcanic area which were so well seen in the famous region of the Yellowstone."

The Professor went on to give a brief account of his journey, mentioning that in crossing the prairies toward the Rocky Mountains he noted, in the few sections that occurred, soft, gray clays and marls, evidently cretaceous, and sometimes tertiary rocks. Getting down at some of the stations, and looking at the ant-hills and burrows of the prairie-dog, he found that the surface of the prairie was veneered with a thin coating of pinkish, fine-grained sand, sometimes approaching to gravel, its color being due to the presence of a great many small pieces of fresh felspar. It was clear that this mineral, as well as the quartz and fragments of topaz which he saw, did not belong to the strata in which they lay. In going west the grains of sand began to get coarser, and assume the form of distinct pebbles, till, when he reached the mountains, these became huge blocks and boulders, evidently derived from the hills in their neighborhood. After submitting that the phrase "Rocky Mountains" was a very unfortunate one, as applied to the great number of independent ridges comparable to waves, that covered this part of America, the Professor said that he halted for a little while on the flanks of the first great mountain ranges—those that formed the colossal bulwarks of Colorado. As seen from the prairies, they form a very picturesque line of peaks. They had been pushed as a great wedge through the rocks forming the prairies, and had carried those rocks up with them. Crystalline masses formed the central core and crest of the range, and this feature was combined with some very interesting facts connected with the surface erosion of the district. He found then where all the pink felspar and gravel had come from; it had been borne down from this region, where great masses of pink granite, gray gneiss and other crystalline rocks formed the core of the mountains. He found that the mountains themselves had been covered with glaciers, which had gone out into the plains and shed their huge

horseshoe-shaped moraines, where now everything was parched and barren. Having crossed the watershed of the Rocky Mountains, he struck westward into the Uintah, one of the few ranges in that region that had an east and west direction. The central portion of this range consisted, not of crystalline rocks wedged through the older rocks, but of carboniferous rocks that had been upraised as a great flat dome, and had been above water for a very long time. This carboniferous centre was particularly interesting from the fact of its presenting the strata perfectly horizontal. They could be seen, terrace after terrace, for miles, and it could be noted whether or not they had been cut through, by faults, to what extent they had been twisted, and to what extent eroded by atmospheric influences. Getting on the tops of these great mountains, he could see that the strata were almost entirely horizontal for miles, and that the valleys had been trenched out of them, not by means of faults at all, but actually by erosion of the surface. He found also that the numerous lakes were true remains of erosion, that they had not been formed by any subterranean movements, but actually gouged out by the ice that once covered those mountains. Striking into one of the valleys, he found beautiful horseshoe moraines. These had gone across the valley and formed a succession of lakes; while the beavers had made a great many more lakes in places not reached by the moraines. In most of those valleys there were hundreds of acres of bog-land, entirely due to the damming of the waters by the beavers. The plains in the neighborhood of the Uintah Mountains, were called "Bad Lands," because they were crumbling down under the action of the weather, and nothing would grow upon them. A skeleton found in a hill of that district was brought to Professor Marsh, and turned out to be the bones of an extinct and undescribed reptile.

From the Uintah Mountains Professor Geikie found his way north into the Yellowstone country, and examined the fading traces of volcanic action. The volcanoes seemed in that region to have confined themselves very much to the valleys. The heights on either hand consisted of crystalline rocks; the bottom of the valley had been literally deluged with sheets of lava.

These were examined with considerable care. In the course of the examination, huge mounds of gravel and stones were met with, which, at the first glance, were evidently moraines. The first was marked by a huge block of rock, an erratic of coarse granite different from the rocks round about. Such blocks he found to increase in number as he went up the valley; and on entering the second cañon, or gorge, he found the sides exquisitely glaciated. It was clear, therefore, that not only was this second cañon old; it was older than the glacial period; it supplied a channel for the glacier that ground its way out from those mountains. Endeavoring to estimate the minimum thickness of the ice, he traced striæ up to 1,000 feet, and they evidently went higher than that. But in going farther up the valley, he found that the erratic blocks of granite and gneiss dropped by the glacier as it melted went far above the 1,000-foot limit; he got them on the shoulder of one of the great hills overlooking the valley 1,600 or 1,700 feet above the bottom of the valley; the ice, therefore, must have been 1,600 or 1,700 feet thick. It thus appeared that not only did those mountains possess glaciers, but some of these were of such thickness as to deserve the name of ice-sheets, covering the whole surrounding region. As to the volcanic phenomena of the district, he saw evidence of a long series of eruptions, one after another, separated by prolonged intervals, during which the river was at work cutting out the older lavas, the newer lavas filling up the hollows eroded by the river. In the grand cañon of the Yellowstone, he saw the most marvellous piece of mineral color anywhere to be seen in the world. It was cut out of tufts of lavas, showing sulphur yellow, green, vermilion, crimson, and orange tints, so marvellous that it was impossible to transfer them to paper.

Leaving the Yellowstone Valley, he struck southwestward into the famous geyser regions, where a number of geysers had been made known of late years more wonderful than those of Iceland. He tried hard here to get a pool to wash in, but could find nothing below 212°, and the only chance of getting a bath was to get into some hole where the water had had time to cool after flowing out of the hot crater. The whole ground was

honeycombed with holes, every one of which was filled with gurgling, boiling water. Some went off with wonderful regularity, others were more capricious; and the chief geyser, which threw up an enormous body of water and steam, was very uncertain in its movements. In one part of the district he came upon a marvellous mud spring, the centre of it boiling like a great porridge-pot full of white and very pasty porridge. Steam rose through this, and, after forming great bubbles, burst, the mud thrown out forming a sort of rim round the crater. After describing a meeting with Indians on their way to a great council, the Professor said his road after that lay across what he supposed was one of the most wonderful lava fields in the world—hundreds and thousands of square miles of country—a sort of rough plain—having been absolutely deluged with lava. How this lava was poured out he at present could hardly tell; it seemed to have risen through long fissures, and spread out so as to fill a vast area. Here and there along the margin of it were distinct volcanic mounds, apparently formed during later stages of its volcanic history.

Coming at length to the Salt Lake territory, one of the first geological features that struck him was the evidence of the former vast expansion of the Salt Lake. He found traces of a terrace well marked along the sides of the mountains, about 1,000 feet above the present level, and so succeeded in discovering what was the relation between the extended lake, which must have been a great many times larger than the present one, and 1,000 feet deeper, and the glaciers which at one time covered the Wahsatch and the Yellowstone Mountains. Striking into some of the cañons descending from the Wahsatch into the Salt Lake basin, he found evidence of wonderful glaciation. The rocks were smoothed and polished and striated by the glaciers that had come down from the heights, and these glaciers had carried with them great quantities of moraine matter. Huge mounds of rubbish blocked up the valleys here and there, and these mounds came down to the level of the highest terrace. That was to say, that, when the Salt Lake extended far beyond its present area, and was over 1,000 feet deeper than now, the glaciers from the

Wahsatch Mountains came down to its edge and shed their bergs over its waters. On his return journey the Professor resumed the examination of the prairies. Coming out of the Colorado Mountains, he noted, in connection with the gravel formerly observed, great quantities of a peculiar gray clay. This clay was inter-stratified with the gravel, and here and there contained a small lacustrine, or terrestrial shell. It was, therefore, a fresh-water deposit, a deposit swept by the waters coming down from the mountains over the prairie; and marked an interval in the period during which the gravel and sand were being thrown down. He traced the gravel mounds over an extensive tract, and he found the gravel had been deposited irregularly, just as would have been the case from the action of water escaping from the melting ends of the ice. A great current would traverse the plain in one direction; then the ice mass would send water in another, so that the whole prairie must have been flooded with water derived from the melting ends of the vast sheets of ice. It was those excessive floods that brought down the gravel and sand; and during that time there were intervals when nothing but the finest mud was coming down, just as was seen in the valleys of the Rhine and Danube.

It seems to be demonstrated by the discoveries of the past few years that no equal portion of the earth's surface contains so large an amount of available mineral wealth as this Western Empire. In only three of the twenty States and Territories which are comprised within it, viz., Louisiana, Kansas, and Nebraska, has there been wanting gold or silver ores, and it is as yet uncertain whether two of these may not yield silver in paying quantities. All the others contain both metals, usually in large quantities, and some of them have, in addition, large mines of quicksilver, and smaller but profitable ones of platinum. The so-called baser but really more useful metals, copper, zinc, lead, and iron, are found in every known form and in the greatest profusion. *Lead* is the most usual basis or matrix of the silver mines, either in the form of galena, or of carbonate, and sometimes of carburet, etc.; but *copper* and *zinc* are not unfrequently found in combination with both gold and silver.

Both copper and zinc are also found, uncombined with either gold or silver, and of such purity as to be profitably mined in many localities.

Iron ores are found abundantly in every State and Territory, and every known ore is found in some districts, and frequently several different ores, as the magnetic, the hæmatite, or the specular ores, in close proximity to each other, and all in the immediate vicinity of coal beds. The railroad iron and steel of the future will be made from native ores in close neighborhood to the tracks where it is needed. But it is not alone for railroad iron or steel rails, that these vast iron deposits can be utilized. The iron of Utah, of California, of Montana, of Colorado, Texas, Missouri and Arizona is not surpassed by any in the world; and when the time shall come, if it ever does, when the long conflict between heavy guns and armored ships shall be decided, our furnaces in this Western Empire will furnish the iron and our foundries the iron and steel plates or the guns which are to shatter them, of a quality which has never been equalled. For all building purposes, and for suspension bridges, for hardware, cutlery, tubing, gas, water, and sewer pipes; for stoves, ranges, furnaces, and heaters, and every other use, to which the best qualities of iron and steel are capable of being applied, the iron ores of the Great West will be found sufficient to supply the needs of a world.

Nickel, now coming so rapidly into use for so many purposes, is an incidental product of many of the iron mines, and can be largely produced. As yet we are importing all or nearly all the *tin* we use, but the tin deposits in California, and in several of the other States and Territories, when once developed by capital and skill, may prove as profitable as those of Cornwall or the Straits of Banca.

Of the rarer metals, which possess but a limited economical value, most are found as abundantly in the Great West as anywhere. Osmium and iridium, two of the hardest of known metals, used in the gold-pen manufacture, as well as in other cases where hard and infusible points are required, are found only on the Pacific coast; many of the exceedingly rare metals

known only to chemists, are obtained from earths or mineral waters found here, while arsenic, antimony, bismuth, cerium, etc., etc., are found in connection with the ores of other metals.

The elementary bases of the mineral earths and salts are more easily separated here than elsewhere; and the mineral springs and volcanic geysers and fountains of the Yellowstone, of many places in California and Nevada, of Colorado, Arizona and Texas, yield not only all the salts of soda, potassa and lime, but their elementary bases also. Borax (biborate of soda) is found as a crust over shallow lakes in California and Nevada; carbonate of soda, very pure in the so-called alkaline lands; nitrates of soda and potassa, in commercial quantities, at various points; sulphate of lime (the commercial plaster of Paris) comes to light not only in its ordinary condition of gypsum, of great value as a fertilizer, but in its rarer and more beautiful forms of selenite, alabaster, etc. Salt is found in every shape, from the rock-salt, hewn out in great cubical blocks, to the brine springs of varying density, and the salt basins around the Great Salt Lake and along the shores and bays of the Pacific. The manufacture of salt on a large scale is one of the most profitable enterprises which could be undertaken. The market is unlimited, and the prices would be remunerative. Most of the mineral salts and acids might be manufactured also on the large scale at many points.

Asphaltum and petroleum are found in large quantities in California, Utah, Wyoming and in the volcanic region around the headwaters of the Yellowstone; and both are likely to be extensively utilized in the near future. Coal occurs abundantly and of all qualities at numerous points in this region. Lignite (the coal formation of the tertiary) is mined in Kansas, Colorado, Wyoming, and perhaps farther west. It is of very good quality, and is used on the railroad locomotives, in manufactories and dwellings to some extent. There is also a bituminous coal of very good quality, but not a coking coal, in Kansas, Wyoming (where the coal-beds are very extensive), in Colorado, and in Utah and New Mexico. The coal-beds in Utah, New Mexico and Arizona are extensive, and of extraordinary thickness. The

coal is of excellent quality, and some of it anthracite and semi-anthracite. There are extensive coal-beds also on the Pacific coast, and those of Washington Territory, and the islands off the coast, are anthracite of the very best quality. Coal is also found, and of good quality, in Texas and Arkansas, but the reliance for fuel there is yet mostly on wood. Marls and peats are found in many of the States and Territories, and, like the gypsum, may yet come into demand for replacing some of the elements of vegetation, which have been drawn from the rich soil by the too frequent sowing of the same crop. At present, however, the soil seems absolutely inexhaustible, and with a proper rotation of crops and constant deep ploughing it probably is so.

There are found in the Rocky Mountains, the Sierra Nevada, the Cascade Mountains, the Coast Range, and the numerous cross ranges and lateral spurs—such as the Uintah, the Wahsatch, the Bitter Root, Wind river, Sweet Water or Laramie ranges, and at the entrance or exit of the cañons of the Colorado, building-stones of the greatest variety, granite, sienite, marbles of all hues and qualities, limestones, slates and sandstones of every shade. Many of the marbles are very beautiful and exquisitely veined; others of the purest and most brilliant white, suitable for statuary and ornamental purposes.

In the Yellowstone Lake region, in the vicinity of the Great Salt Lake, and in the sides of the cañons of the Yellowstone, Snake, Columbia, Colorado, and other large rivers, the stratified clays exhibit such an infinity of shades of the most brilliant colors as to baffle the skill of the most accomplished artist, and throw him into the depths of despair at his inability to reproduce them.

What are known as the "Bad Lands" in Dakota, Nebraska, Wyoming, and Montana abound in fossils, and recent explorations show that there are deposited here in the successive strata, eroded by water and ice, the material from which can be traced the history of families of animals in their various stages of advance or degradation, to a greater extent than in any other explored region of the earth's surface. Vastly greater discoveries undoubtedly remain to be made, and it is perhaps safe to

predict, that these wild and utterly desolate lands will yet yield, to the scientific explorer, a complete history of the mammals and reptiles which lived on the earth in the carboniferous and cretaceous periods.

In that class of minerals known as precious stones there is hardly anything lacking except the diamond, and it is certainly within the bounds of possibility that even that may yet be found. What are known as California diamonds, though possessing many characteristics of the true gem, are probably only very fine specimens of crystals of quartz or silica. But the other valuable gems, as emeralds, probably also rubies, and topazes, precious beryls, chrysolite, amethyst, gold-stones, tourmalines, jades, the beautiful copper ore known as malachite, agates and carnelians of great beauty, jet, etc., etc., are sufficiently plentiful, in one part of the country or another.

Porcelain clays, ochres, barytes, and other minerals and earths of economic use are found in most of the States and Territories. Mineral springs, and waters of every variety and every degree of temperature, from boiling to freezing, are found everywhere in the mountains, and not a few in the plains. Colorado, Montana, Idaho, Wyoming, Utah, California, Arizona, Texas and Arkansas abound in these healing waters. In Colorado there are hundreds of them already claiming patronage, each with some peculiar merit. In the Yellowstone Park and its vicinity most of the springs are too hot for bathing; but when partially cooled, possess remarkable hygienic virtues.

CHAPTER VIII.

CLIMATES—VARIETY OF CLIMATE—CAUSES—RAINFALL—COMPARISON OF DIFFERENT SECTIONS—CAUSES OF DEFICIENT RAINFALL—WINDS—CHARACTER AND EFFECT OF DIFFERENT WINDS—THE HOT WINDS FROM MEXICO.

In a region extending 1,700 miles from north to south, and 1,800 from east to west, there would be a considerable range of climatic conditions, even if the whole tract were nearly a dead

level; but when two-thirds or three-fourths of it is traversed by mountain chains, many of whose summits have an elevation of 13,000 to 14,000 feet, and the average height of its plateaux and valleys ranges from 4,000 to 8,500 feet; when on the more northern summits, snow lies throughout the year; and when the temperature of at least the western half is modified by the breezes and moisture from the Pacific, by the influences of the Pacific gulf stream, and by the climatic law that the Western coast of a continent has always a milder and higher temperature than the East coast; when, also, the temperature of the Southwest is elevated by the hot and dry winds which come from tropical Mexico; and the cyclones formed in the Caribbean sea and the Mexican gulf contribute their share to the disturbance of atmospheric conditions, there would seem to be causes enough to account for the extraordinary diversities of climate which prevail in this Western Empire.

The climate on the northwestern coast in Washington Territory and Oregon is temperate, and the range comparatively small. The mercury seldom rises above 90° F., in many seasons not reaching that figure, and rarely falls below 10° or 12° . In some seasons the lowest point reached is 18° or 20° . The average annual range is from 70° to 80° . The range on the California coast, at Los Angeles, San Diego, etc., is still smaller, in some years not exceeding 55° or 60° . In San Francisco the range is not over 50° or 53° —between 39° and 90° or 92° . These equable climates are very favorable to the health of invalids, especially to such as are suffering from pulmonary diseases. East of the Coast range, and in a still greater degree, east of the Cascades or Sierra Nevada and the Rocky Mountains, we find greater extremes of cold, and in some instances of heat also. The plains of Eastern Washington and Oregon have extreme heat in summer, rising sometimes to or above 100° F., and cold equally extreme in winter, falling to -30° or even lower in winter, making the annual range not less than 130° F. But probably Pembina, in Dakota, just on the British line, 49° north latitude, is the coldest inhabited place in all this Western Empire, and as the summer heat is intense, though for a brief period only, its

annual range is the greatest. The spirit thermometer often marks -50° in the winter, and in the winter of 1879-80 it is reported to have fallen to -60° . As it attains 94° in the summer, this gives a range of 154° . The remainder of Dakota and Minnesota is not subject to such extreme changes, though the valley of the Red river of the North seems to be the gateway through which the biting cold from the Arctic regions finds its way southward. The interior valleys of California are much hotter in summer than the coast, and the winter temperature is somewhat lower. Their range is from 76° to 83° . In portions of New Mexico the climate is more equable, the mercury rarely rising in Santa Fé above 90° , though for one or two days in December it may drop to zero. But the hottest portions of this whole region are unquestionably Southern Arizona and Southern Texas. At Yuma, Maricopa Wells, Tucson, Phoenix, Wickenburg and other towns of Southern Arizona, and at Rio Grande City, Laredo, Corsicana and other towns of Southern Texas (Galveston excepted, in consequence of its island climate), the summer heat during June, July, August and September reaches 117° , and occasionally even more, and rises above 100° usually for three-fourths of the days of those months. Some years ago a company of soldiers were stationed at a fort in one of the interior valleys of California. The weather was fearfully hot, the mercury at over 110° in the shade, and the men were grumbling as only soldiers can grumble at the heat. After a time one old soldier, bronzed by the tropical heats, said: "Boys, stop grumbling; this weather is not to be compared with what we had at Fort Yuma." "Were you ever at Fort Yuma?" asked the soldiers. "Yes, I was there three years," said the veteran. "Well, how hot was it there? How high did the thermometer get?" "I don't know anything about your thermometers," answered the soldier; "but I can tell you this: when I had been there about two years, two of our fellows died, and they were pretty hard fellows, too. Well, the second night after they died they came back after their blankets, and they hadn't wanted them once in all the while they had been in Yuma."

In the region known as the plains, which embraces the greater

part of Minnesota, Iowa, Western Missouri, Nebraska, Kansas, Southeastern Dakota, Eastern Wyoming and Eastern Colorado, part of Arkansas and the Indian Territory, and Northern Texas, the climate is generally warm in summer, though the heat is not intense. The spring opens earlier as we proceed southward, and the autumn is later. There are strong winds and sometimes cyclones, but, except in Minnesota and Iowa, the snow does not cover the ground for any long period, and cattle and sheep require little or no shelter or winter feeding. Prudent herdsmen and sheep-masters make provision for fifty or sixty days shelter of their herds or flocks, and for feeding them during that time ; but in at least two seasons out of three, the food and shelter are not needed, or for a few days only. This does not apply to the two States named above, where the winter generally lasts for at least four or five months. There is, moreover, a very considerable difference in the climate of these plains, resulting from their increasing elevation as we proceed westward. Though they are called plains and prairies, they are really plateaux, rising gradually from the Mississippi or Missouri river to the eastern slope of the Rocky Mountains. Their elevation on the eastern border of the plateau is from 600 to 800 feet above the sea. At the western boundary of Kansas and Nebraska it is over 5,000 feet above the sea, and at the foothills of the Rocky Mountains in Eastern Colorado between 6,000 and 7,000 feet. Indeed, so gradual is the ascent, and so nearly of the same height with the passes in the Rocky Mountains (that over which the Union Pacific crosses being only about 8,700 feet above the sea) that passengers on that road often inquire, when they will begin to ascend the Rocky Mountains, after they have crossed this pass, or, as the western people say, "the divide." On these more elevated lands the sun may be hot at mid-day in summer, but the nights, and evening, and morning, are always cool and refreshing. The annual range of the thermometer is only from fifty-five to sixty degrees, and cattle, and sheep, except, perhaps, once in eight or ten years, can browse throughout the entire winter without shelter. The absence of trees in the western portion of this plateau also modifies this climate to some extent, making the summer's heat more

intense, and the cold, wintry winds more searching, and far-reaching in their effect. The changes now going on, all along this region, as the result of breaking up the hard beaten soil, and planting trees in great numbers, will not be without their effect in modifying the temperature; and by the interposition of masses of timber, breaking the fury of the winds.

There can be no doubt that, apart from such diseases as may be induced or aggravated by a rarefied atmosphere, this elevated region is more healthful than any other on our continent. There are enough who die from natural or unnatural causes, but the dry, pure, invigorating atmosphere of the Rocky Mountain plateaux is eminently conducive to health, especially to those who are suffering from pulmonary diseases. Still to reap the full benefit of this climate, the health-seeker must stay there. A return to the East after one, or two, or even four years almost inevitably brings back the disease, and causes it to prove fatal.

We have elsewhere discussed the rainfall of most portions of this vast Western Empire. It is even more varied in quantity, in different districts, than is the climate in temperature. The Northwest coast, in Washington, Oregon, and the extreme northern portion of California, have, at some points, a more copious rainfall than any other portion of the United States, though nearly approached by some points on the Atlantic coast. In two or three places in the States and Territory named, the annual precipitation ranges from 123 to 135 inches, and once or twice has exceeded even the latter figure: ten or eleven feet of rainfall. At San Diego on the same coast, but nearly 1,000 miles farther south, the rainfall in 1876-77 was but 3.80 inches; and at Fort Yuma, near the mouth of the Colorado, in 1877-78, but 2.00 inches. These are the extremes. On the Gulf coast in Texas, the precipitation is large, ranging from fifty-four to sixty-seven inches. In the interior the amount varies with the longitude. From the Mississippi river to about the 97th degree of west longitude it ranges from forty-five inches to twenty-eight inches, diminishing as we proceed westward. From this meridian to about 117, it ranges from twenty-five inches to twelve inches, or perhaps 11.5 in some seasons. Farther west it rises to thirty-three inches, and

between the Cascades and the Rocky Mountains attains at some points to forty-two inches. Of course there are variations from north to south as well as from east to west; variations produced also by the presence or absence of extensive forests, by the compactness of the soil, owing to its having been for hundreds of years trodden under the hoofs of millions of bisons, or its porousness from thorough cultivation. The electrical condition of the atmosphere has also much to do with the amount of precipitation. In general it may be said that fully two-thirds of the arable lands of the Great West have a sufficient amount of precipitation to raise any desired crops, with deep plowing, and the other third, while requiring moderate and in some cases very thorough irrigation to produce the largest crops, are so situated as to be able at moderate expense to obtain all the water needed for this purpose, and under its influence yield such abundant crops as to pay, in one or at the utmost two years, the cost of the ditches. Indeed the proprietors of the irrigated lands look down with a half-contemptuous pity upon the poor farmers who are dependent upon the rainfall alone for their crops. "Poor fellows," they say, "when they sow their grain or plant their crops, they can never tell what will befall them; they may have too much rain, and their crops will be drowned out, or rot in the earth, or they may not have enough, and their fields will be burned by the fiery breath of the sun; they can never tell whether they can raise a crop or not. With us, now, the whole matter can be determined with mathematical exactness. We know just how much water is needed to bring the land to its highest productiveness, and we give it just that much and no more. If we have rains we irrigate less; if the season is dry, we turn on more water, and we have a good crop every year." As the vacillating judge said: "There is a good deal to be said on both sides of this question."

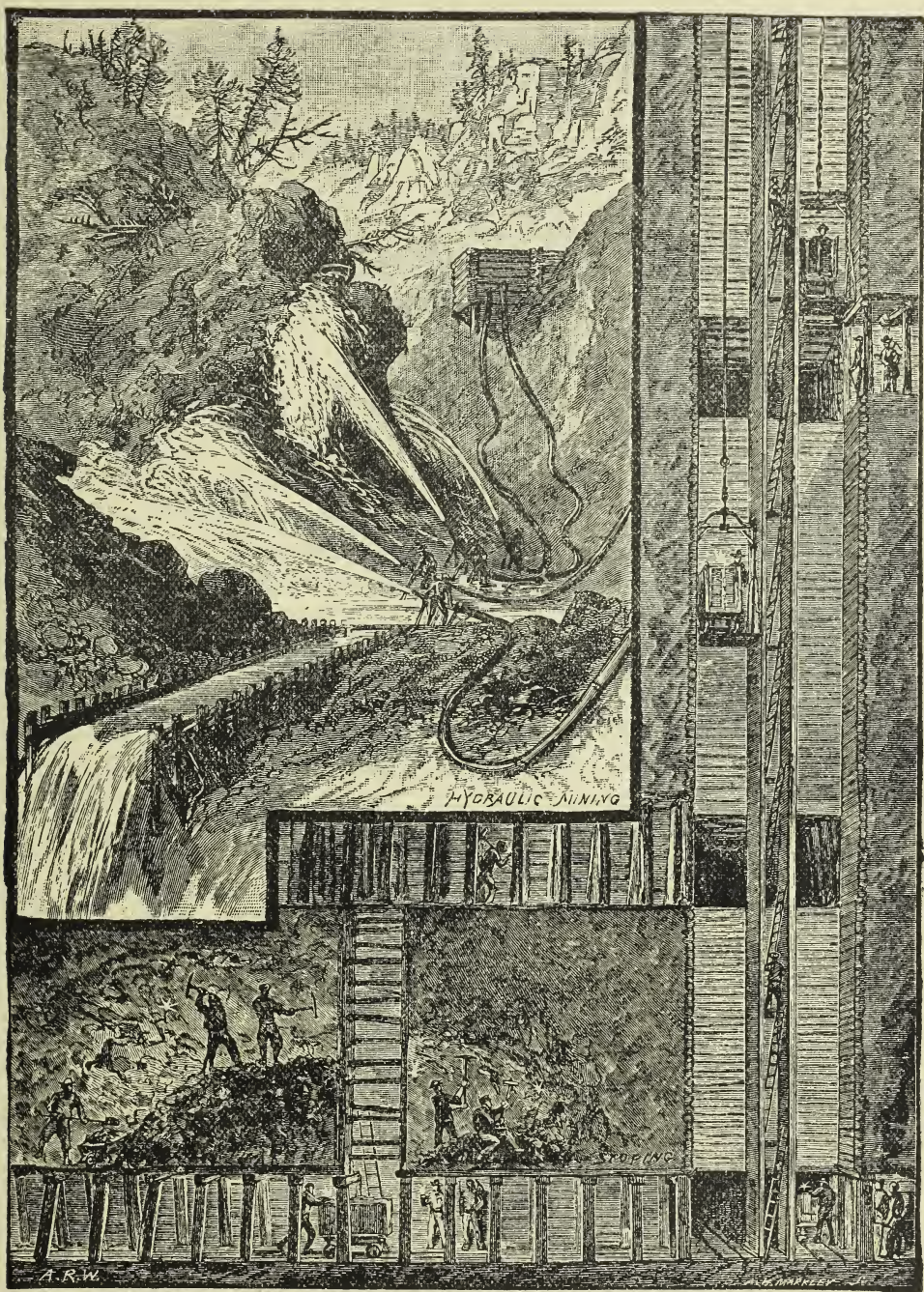
We have already alluded to the high winds which prevail over some portions of this vast region; but the investigations of the Signal Service officers have in a great degree systematized our knowledge on this subject. On the Pacific coast, and as far eastward as the summit of the Sierra Nevada or Cascade Mountains, and possibly for a part of the distance, where they obtain access

through transverse valleys to the western slope of the Rocky Mountains, the west winds from the Pacific Ocean, laden with moisture, sweep across the mountains and valleys, depositing much of their water as snow upon the mountains. These are cool but not cold winds. From Hudson's Bay and the ice-clad waters of the north comes down, especially in winter, a cold, piercing wind, through the broad valley of the Red river of the North, producing intense cold and often snows on the plains, and spending much of its fury on the Mississippi valley and States farther east. This is perhaps the source of the Texas Northerers, though the severity of the cold has been much diminished before it reaches the Gulf coast. East winds are not prevalent in any part of this region, and when they do occur have no special character or significance. A south wind from the Gulf of Mexico is much more frequent, and is generally a moist and grateful wind; sometimes in the summer it may bring with it electrical phenomena, and be the herald of destructive cyclones. The southwest wind which sweeps across Arizona, Western Texas, New Mexico, and Southern Utah, and Nevada, affecting also at times Western Colorado and Wyoming, is from Mexico, and has been heated in its passage across the semi-tropical lands of Mexico and Central America till it blows a hot blast over these lands which intensifies the summer's heat, though it may make the autumn and winter milder. As the country becomes settled and cultivated, this hot wind will lose something of its intensity, and become rather an agreeable adjuvant in mitigating the cold of the wintry months.

CHAPTER IX.

THE VARIOUS PROCESSES OF MINING—PLACER MINING—GOLD DISCOVERY IN CALIFORNIA—THE PAN—THE ROCKER—THE DITCH AND THE “TOM”—THE SLUICE—HYDRAULIC MINING—HYDRAULIC MINING NOT ÆSTHETIC—LODE OR QUARTZ MINING—TRUE FISSURE VEINS—THE “COUNTRY” ROCK—CHIMNEYS, CHIMES, OR BONANZAS—POCKETS—CONTACT LODES—GOLD COMBINED WITH SULPHURETS—STOPING—DEPTH OF MINES—THE REDUCTION OF PYRITOUS ORES—GOLD WITH OXIDE OF IRON—COST OF REDUCTION OF GOLD—DISCOVERIES OF SILVER ORES—SILVER WIDELY DIFFUSED—MODES OF REDUCTION—THE BEST MINING REGIONS—PLACER MINING: THE BEST LOCATIONS—DIFFICULTIES OF PLACER MINING—DIFFICULTIES OF LODE OR VEIN MINING—THE BEST MINES BOUGHT UP BY CAPITALISTS—THE BEST LOCATIONS FOR EXPERTS.

WE confine our attention for the present to mining for gold and silver, including, however, the ores of lead and copper and perhaps iron, with which they are found combined or commingled. Gold mining is of two kinds, and each kind has its several processes. These two kinds are *Placer* mining, and *Lode* mining. Silver is always found only in lodes, but these are of various forms or combinations. Placers are deposits of gold nearly in a pure state, which at some time, remote or recent, have been washed out of the veins or lodes into which they were injected by some convulsion of nature, by the long continued action of running water, and deposited with gravel or clay on the bed rock of the stream which bore them down its current. The beds of most of the streams flowing from the mountains, especially if they have cut deep channels in the rocks in any portion of their course, were found to contain these placers, of greater or less value; but the placers which are found in the beds of ancient streams, which by upheaval or change of course have ceased to flow, and are perhaps now many hundred feet below the surface, are usually more productive than those of more recent origin. The placer gold is free gold; that is, it is uncombined with any other mineral, and may exist as a powder, as scales, or as little pellets or nuggets of considerable size. In California, as everywhere else, it was the first gold discovered, and *there*, by accident.



A SECTION OF A MINE—HYDRAULIC MINING.

The story of this discovery has been often related; but the statement made by the late Hon. J. Ross Browne in 1867, when he was United States Mining Commissioner, is believed to be the only one which gives the facts as they were. Mr. Browne says:

"It was on the 19th day of January, 1848, ten days before the treaty of Guadalupe-Hidalgo was signed, and three months before the ratified copies were exchanged, that James W. Marshall, while engaged in digging a race for a saw-mill at Coloma, about thirty-five miles eastward from Sutter's Fort, found some pieces of yellow metal, which he and the half-dozen men working with him at the mill supposed to be gold. He felt confident that he had made a discovery of great importance, but he knew nothing of either chemistry or gold mining, so he could not prove the nature of the metal or tell how to obtain it in paying quantities. Every morning he went down to the race to look for the bits of the metal; but the other men at the mill thought Marshall was very wild in his ideas, and they continued their labors in building the mill, and in sowing wheat, and planting vegetables. The swift current of the mill-race washed away a considerable body of earthy matter, leaving the coarse particles of gold behind, so Marshall's collection of specimens continued to accumulate, and his associates began to think there might be something in his gold mine after all. About the middle of February, a Mr. Bennett, one of the party employed at the mill, went to San Francisco for the purpose of learning whether this metal was precious, and there he was introduced to Isaac Humphrey, who had washed for gold in Georgia. The experienced miner saw at a glance that he had the true stuff before him, and after a few inquiries he was satisfied that the diggings must be rich. He made immediate preparation to go to the mill, and tried to persuade some of his friends to go with him, but they thought it would be only a waste of time and money, so he went with Bennett for his sole companion.

"He arrived at Coloma on the 7th of March, and found the work at the mill going on as if no gold existed in the neighborhood. The next day he took a pan and spade and washed some of the dirt from the bottom of the mill-race in places where

Marshall had found his specimens, and in a few hours Humphrey declared that these mines were far richer than any in Georgia.

"He now made a rocker, and went to work washing gold industriously, and every day yielded him an ounce or two of metal. The men at the mill made rockers for themselves, and all were soon busy in search of the yellow metal.

"Everything else was abandoned; the rumor of the discovery spread slowly. In the middle of March, Pearson B. Reading, the owner of a large ranch at the head of the Sacramento valley, happened to visit Sutter's Fort, and hearing of the mining at Coloma, he went thither to see it. He said that if similarity of formation could be taken as proof, there must be gold mines near his ranch, so after observing the method of washing, he posted off, and in a few weeks he was at work on the bars of Clear creek, nearly two hundred miles northwestward from Coloma. A few days after Reading had left, John Bidwell, since representative of the northern district of the State in the lower house of Congress, came to Coloma, and the result of his visit was that in less than a month he had a party of Indians from his ranch washing gold on the bars of Feather river, seventy-five miles northwestward from Coloma. Thus the mines were opened at far distant points."

On the 29th of May, 1848, the only paper published in San Francisco said: "The whole country, from San Francisco to Los Angeles, and from the sea-shore to the base of the Sierra Nevada, resounds with the sordid cry of *gold! gold! gold!* while the field is left half planted, the house half built, and everything neglected but the manufacture of picks and shovels, and the means of transportation to the spot where one man obtained \$128 worth of the real stuff in one day's washing; and the average for all concerned is \$20 per diem."

"The towns and farms were deserted, or left to the care of women and children, while rancheros, wood-choppers, mechanics, vaqueros, and soldiers and sailors, who had deserted or obtained leave of absence, devoted all their energies to washing the auriferous gravel of the Sacramento basin. Never satisfied, however much they might be making, they were continually

looking for new placers which might yield them twice or thrice as much as they had made before. Thus the area of their labors gradually extended, and at the end of 1848 miners were at work in every large stream on the western slope of the Sierra Nevada, from the Feather to the Tuolumne river, a distance of 150 miles, and also at Reading's diggings, in the northwestern corner of the Sacramento valley."

For the first two years the miners who made these discoveries depended for their profits mainly on the pan and the rocker. The placer miner's pan was made of sheet-iron or tinned iron, with a flat bottom about a foot in diameter, and sides six inches high, inclining outwards at an angle of forty or fifty degrees. The gold was found, as it usually is, in a tough clay which enveloped gravel and large pebbles as well as sand. This clay must be thoroughly dissolved or reduced to the condition of fluid mud; and so the miner filled his pan with it, went to the bank of the river or stream, squatted down there, put his pan under water, and shook it horizontally, so as to get the mass thoroughly soaked; then picked out the larger stones with one hand and mashed up the largest and toughest lumps of clay, and again shook his pan under water, and when all the dirt seemed to be dissolved so that the gold could be carried to the bottom by its weight, he tilted up the pan a little to let the thin mud and light sand run out, repeating this process till all was washed out except the metal which remained at the bottom.

After a time this process was found too slow, and the rocker took its place. This was constructed somewhat like a child's cradle, but the upper end was considerably higher than the lower, and contained a large riddle or colander of sheet-iron punched with holes on the bottom; underneath the floor of the rocker was provided with cleats or riffles, extending nearly across, to catch the gold. The miner filled his riddle with pay-dirt and rocked the rocker with one hand while he poured water upon the dirt and riddle with the other. The water and the motion dissolved the clay and carried it down to the floor of the rocker, where the cleats caught the gold, while the mud and water ran off. The riddle could be taken off to throw out the larger stones.

Soon the rocker was abandoned because it could not work fast enough, and ditches were dug and flumes constructed to bring the water from a sufficient height to do the washing-out of the clay and gravel without so much manual labor and with more abundant production; some of these flumes were very large and many miles in extent, and erected at an immense cost. With the ditches came in first the "Tom," which had previously been used in Georgia: a trough twelve feet long, eight inches deep, fifteen inches wide at the head and thirty at the foot; a riddle of sheet-iron, punched with holes half an inch in diameter, formed the bottom of the "Tom" at the lower end, so placed that all the water and the mud should fall through the holes of the riddle, and none pass over the sides or end. The water fell into a flat box with cleats on the bottom, giving passage at alternate ends to the mud and water, while the gold was caught on the cleats or riffles. A stream of water ran constantly through the "Tom," into the head of which the pay-dirt was thrown by several men, while one threw out the stones too large to pass the riddle and threw back to the head the lumps of clay which had reached the foot without being dissolved.

The "Tom" was succeeded by "the Sluice," a board-trough from a hundred to five thousand feet long, having a descent of one foot in twenty, and with riffles at the lower end to catch the gold. Twenty men or more could throw in the pay-dirt at the upper end, and the water in its long and rapid course would tear the lumps to pieces, and before reaching the end deposit the gold on the riffles, from which it is taken four or five times a day. Where the gold was in fine powder or scales, quicksilver was placed on the riffles to form an instantaneous amalgam, and thus very much of the gold was saved. This sluice was unquestionably the most efficient and successful of all the contrivances in aid of placer-mining; but there was now a new difficulty, or a series of them, to be overcome. The placers in the river and creek-beds and near the surface of gravel-beds, were beginning to give out; in many places, too, these placer-deposits had been traced up to the lodes or veins in the rocks which had been worn down by the water of the stream, and which had thus fur-

nished the placer-deposits. It was discovered, also, that there were, in many places, extensive deposits of gold-bearing gravel, hills of considerable height and length, which had, untold ages before, been the beds of rivers, but had been upheaved, and were now rich placers, if they could be broken down and the pay-dirt run through the sluices. To do this by hand labor was too costly and wearisome. Even now, in the best sluices connected with good ditches, the labor of twenty-five or thirty men in a fair placer-deposit, was not sufficient to supply the sluice with pay-dirt, and much of the costly water ran to waste.

The remedy for these difficulties was found in "hydraulic mining." The sluice was enlarged, and its upper portion expanded so as to take in a width of perhaps a hundred feet of the adjacent hill, which had previously been found to contain gold; water was supplied to it from a ditch usually with a considerable head, and standing at a convenient distance, say 200 feet or more, from the face of the hill, a strong miner directed upon it a stream of water from a hose-pipe or nozzle having a diameter of three to six inches, and a head of two or three hundred feet. The effect of this continuous stream of water coming with such force must be seen to be appreciated; wherever it struck it tore away earth, gravel and boulders; if the pipe was directed on a point some distance below the surface of the hill, the crust above it soon fell, and one, two or three hundred cubic yards of earth were washed into the sluice in a single day. Bars were placed across the sluice to arrest and turn off the larger stones and boulders, and four or five men could accomplish more and gain larger returns than four or five hundred by the old processes.

This process of washing down the hills has been continued, and is still in progress in many portions of the gold-bearing regions of the Great West. Sometimes the clay which binds together the gold-bearing gravel and sand is too tough and compact to be broken down even by the force of the hydraulic stream; then the miner tunnels the hill at its base and introduces an immense charge of gunpowder, giant-powder, gun-cotton, dynamite or nitro-glycerine, which, when exploded, breaks up the tough clay and renders the hitherto difficult task of the hydraulic pipe easy

and swift. By this process of hydraulic mining the gold production has been largely maintained at nearly its old standard, and millions of dollars worth of gold bullion have been put upon the market. The ordinary placer mining is nearly at an end, except at some of the newer points. It is still conducted, to some extent, in Arizona, New Mexico, in portions of Wyoming, and in the Black Hills; but hydraulic mining is now practised wherever the ancient deposits of gold in gravel can be found, and water with a sufficient head can be obtained.

Hydraulic, or even sluice mining is not an æsthetic pursuit; the regions where it is practised may be, before the miner's advent, like the garden of the Lord for beauty; but after his work is completed, they bear no resemblance to anything, except the chaos which greeted the eye of the seer at the dawn of the Mosaic record of the rehabilitation of the earth for the use of man,—“without form and void”—“*Tohu e bohu*”—“the line of confusion and the stones of emptiness.” It is impossible to conceive of anything more desolate, more utterly forbidding, than a region which has been subjected to this hydraulic mining treatment; boulders of all sizes are scattered over the surface, and around them coarse gravel, incapable of sustaining vegetation; the streams are filled up with a fine clay, and very possibly overflow their banks, producing dreary marshes, and the whole vista is one of extreme desolation and ruin.

We have already spoken of the tracing up of the gold deposits of the placers to the lodes or veins from which they had been washed out; let us now turn to these veins or lodes, and ascertain what were the processes by which the precious metal was extracted from them, or, in other words, how lode, or, as it is often called, quartz mining is conducted.

And, first, of the vein or lode. Where this contains gold (and it is of gold mining we are now speaking), it is almost always a vein of quartz, and usually of the milky opaque kind, scarcely showing any signs of crystallization. It is often found in slate, sometimes in porphyritic rock. The quartz is sometimes very hard, sometimes soft and crumbling; it may show the gold, if that is in particles of considerable size, but where it is in fine grains,

it frequently does not show it at all. The gold is very irregularly distributed in the quartz, some portions being largely charged with it, while again, for long distances, the quartz vein is entirely barren of gold. Sometimes the vein contains rounded pebbles, or, as Eastern men would say, cobble-stones, of large size, of very hard quartz, containing no gold, but bridging or plugging the vein. These are generally surrounded by soft, sometimes crumbling, quartz, which usually contains some gold. They are called by the miners "boulder veins." Sometimes the course of the vein is blocked by a mass of porphyry or hard slate, which completely stops the miner's progress until it is cut through, and it may extend for several feet or yards. This is called by the miners a "horse."

A true fissure vein is one which is formed by the filling up of a crack or fissure in the harder rocks (occasioned by earthquake, upheaval, or in some other way) with conglomerate, quartz and other matters, into which gold, either free or in combination with other metals or minerals, has been injected at intervals, in a fluid state. The width of the vein is the width of the crack or fissure; its length, the length to which the fissure extends within a moderate distance of the surface; its depth may be limited by the depth of the stratum in which it occurs, but more generally extends far lower than any mining excavations can reach. The fissures and the veins are found at all conceivable angles or dips. Rarely they are found nearly horizontal, but this though at first a seeming advantage, is hardly a real one, inasmuch as from the nearly level character of the land adjacent there will be great difficulty eventually in freeing the lower levels of the mine from the water which accumulates. Often the dip of the fissure and the strata adjacent is at an angle of twenty, thirty, forty, or fifty degrees with the surface; sometimes it is even perpendicular; and where the angle is considerable and the vein or lode is first discovered on a hillside or near its summit, a tunnel run at a much lower level, so as to strike the vein, affords the best means of draining it.

Not only does the fissure dip at very various angles, but it may penetrate the harder rocks at any angle varying from the

perpendicular, so that the entire vein may enter the rocks in a slanting direction, and the walls of slate or porphyry which enclose the vein, and are called in miners' parlance "country rock," may slope at an angle of forty-five degrees, or be even nearly horizontal in position, while they have at the same time the downward trend of the rocky stratum to which they belong.

The true fissure vein may have, and the best veins often do have, chimneys, chutes, bonanzas, or branch fissures, generally connecting with the main vein or lode on its upper side, at an angle of from thirty to forty-five degrees, which may be richer in gold than the main vein. These chutes or chimneys often extend downward into the true or main vein, and are thought to determine in part its value. The mining geologists think that they were deposited much as soot is in a chimney, the gold being in a fluid or gaseous condition at the time.

Gold as well as silver is sometimes found in considerable quantities in pockets, or small cavities in the rocks, and these, which are sometimes of moderate extent, may yield a fortune to one or two men; but these pockets are seldom connected with a true fissure vein, and when once exhausted, are not of any value, even as indications of the presence of fissure veins or lodes in the vicinity.

It was supposed previous to 1877, that the experience of centuries in mining for gold and silver had developed all the modes in which the precious metals or their ores, were deposited in the earth, to be brought out for the use of man. The placer mines, and the veins or lodes, the true fissure veins, as they were called, were reckoned the only methods by which, in the processes of nature, large quantities of these metals or ores were deposited. There might be, indeed, pockets and chimneys of nearly pure metal, which, when the miner stumbled upon them, would add greatly to his profits so long as they lasted; but these were only incidents or accidents, not to be taken into account in scientific mining. It was reserved for the opening of mines of silver and gold at Leadville, and subsequently at other points in the San Juan and Gunnison districts, and probably also in Utah, to bring to light two discoveries which are of the greatest importance to

miners and holders of mining property. The first and most obvious one was that silver, and to some extent also gold, in combination with lead, existed in large quantities and very rich ores, in other forms than the argentiferous galena or sulphuret, and that sulphur was not a necessary accompaniment of silver and gold ores, whether in combination with lead, zinc, copper, or iron. The *carbonates* of lead, etc., have proved the most productive of combinations. The second discovery was still more important, and is only just beginning to be understood: it is, *that the deposits of ore need not be in fissure veins, or lodes, in placers, in pockets, or in chimneys*; but that there is another form, perhaps as productive, and certainly more easily worked—that of “*contact lodes*,” by which are meant deposits of silver ore, spread with a considerable thickness over the surface of a stratum of rock, and following it in all its sinuosities and its dip over a great extent. Unlike the fissure veins, these are not of great depth, though sometimes they occur in two or three layers with the strata of sandstone or limestone between. These contact lodes generally occur in cavernous limestone or sandstone.

As we have already intimated, gold is found in the lodes, either free—*i. e.*, pure or nearly so, or combined with sulphurets of iron, copper, lead or zinc, in the form of pyrites. Its treatment after it comes from the mine differs somewhat in the two cases. The amount of gold in the quartz is often very small—smaller one hundred feet below the surface than near the surface; but, except in the barren portions of the vein, not diminishing or increasing very greatly in the lowest levels which have been reached (and some of these exceed 3,000 feet, or three-fifths of a mile). Quartz or ore which will assay twenty-three or four dollars per ton, and which yields after being put through the stamp batteries and the amalgamating process eighteen dollars per ton, is regarded as very good. Not over one-fourth of the gold mines exceed this, and very many fall below it, and are yet worked at a moderate profit.

THE MINING AND REDUCING PROCESSES are these: A lode or vein having been traced out which bears evidence of being a true fissure vein, and the claim (1,500 feet in length, and 300 in width,

being the general extent of a single claim) being duly entered, the mine-owner begins operations by sinking a shaft in the line of the vein to ascertain its quality, and, when the shaft is down fifty or a hundred feet, running an adit or level along the course of the vein to ascertain its quality at that depth; sometimes a *winze* is cut,—two adits at different levels cutting across the vein or veins at levels fifty feet apart, and connected with each other at their further extremity by a shaft which does not rise to the surface. Sometimes, if the shaft is on the top or side of a hill, a tunnel is run to it from the base of the hill for the purposes of drainage, ventilation and the more easy transportation of the ore. If on the examination of the quartz, or ore taken from the vein at this depth, the promise of success is good, additional capital is enlisted, and the shaft is constructed to a greater depth, levels or adits run at different levels and of considerable length, rails put down on the levels, steam-hoisting machinery set up at the mouth of the shaft, pumping machinery put in to relieve the mine of the accumulation of water (which is often very hot—as high as 154° F. in some of the Nevada mines), and stoping, either overhand or underhand, commenced, especially if the vein or veins dip at an angle of 40° or 50° . Stoping is the breaking out with a pickaxe the quartz of the vein, and letting it fall on the level ready to be hoisted by the machinery. If the miner stands at his work and brings down the quartz from the vein at the level of his breast or above, it is called “overhand stoping;” if he picks it from about his feet or below and stoops, sits or crouches at his work, and the masses thus broken out fall to the level below, it is “underhand stoping.”

This mining, if profitable, may be extended to as great a depth as may be desired, the only checks upon it being, the great expense of the pumping apparatus at considerable depths, and the difficulty of freeing the mine from water; the more than torrid temperature in the deep mines, and the time and expense of hoisting the ores from such great depths. By a tunnel like the Sutro tunnel, the water can be carried off at moderate expense, the heat greatly mitigated by free ventilation, and the ores hoisted and brought to the surface at a much lower cost; but such tunnels are exceedingly expensive.

The ore broken out and hoisted to the surface is now ready for reduction. If the masses are of large size they are at first put through the rock-breaker, which reduces them to the size of a goose-egg; they are next conducted to the stamp-batteries or stamp-mill, where they are fed into the stamping-machine, a cylindrical machine, whose walls are of hardened chilled iron, its floor or mortar of the hardest steel, and a solid mass of chilled iron faced with hard steel, of cylindrical form, descends with a twisting motion upon the quartz, grinding and crushing it to powder—the inner surface of the cylinder is coated generally with quicksilver, and the powdered quartz mingled with water in the stamping-machine, flows out upon amalgamated copper plates, which have a sufficient extent to catch the larger part of the gold particles. The stamping-machine is cleaned out at frequent intervals, and the plates have their coating of amalgam removed, the superfluous quicksilver is squeezed out through buckskin, and the remainder expelled by heat, the sublimed quicksilver being recovered for future use. The gold remains a spongy mass, but is melted and cast in the form of an ingot.

This is the improved process of to-day, the result of twenty-five years of experiment and invention. By this process about seventy-five per cent. of the gold is saved, whereas with the ruder processes of the arastra and the earlier stamp-mills, only from sixteen to forty per cent. of the gold was secured; and the working over of the tailings of the arastras and of the long Toms, and early sluices, by Chinese miners, yielded them a very profitable harvest of gold. A new process has recently been devised, which, bringing galvanic action to bear upon the masses of ore of the size of a goose-egg, reduces them to a state of disintegration, rendering the stamp-mills unnecessary and causing the lumps to crumble upon mere pressure, sets the entire gold in the ore free instantly, and thus dispensing with much costly machinery, at the same time greatly increases the gold production.

If, as was largely the case in Colorado and to some extent in some of the other States and Territories, the gold was combined with the sulphurets, and came from the mine as pyrites, it was, either before or after being put into the rock-breaker, roasted to

expel the sulphur, which prevented amalgamation. This is now done at some mills in the open air, at others in furnaces. When roasted it is reduced to powder under water in the stamp-mills, amalgamated in the mortars, passed over the amalgamated copper plates, and beyond these made to flow over rough, thick, hairy, woollen blankets, which catch a considerable quantity of the gold which is saved by repeated washings; the stream of water, still thick with the powdered quartz, falls into tanks called buddling tanks, where it settles, and from the lower portion of the buddled tailings, a dollar or two more of gold is extracted. By a process invented by T. A. Edison, the electrician, these buddled tailings are made to yield up a large and profitable residue of the gold hitherto wasted.

In the Black Hills, Dakota, the gold is largely combined or encrusted with oxide of iron, and requires a somewhat different treatment, to free it from the iron, which prevents the gold from amalgamating, and requires the patient labor of the Chinese to extract that which remains in the tailings. This oxide of iron, in the placer deposits, coats over the gold and gravel and forms a dense and firm cement, sometimes of great extent, which cannot be washed out in the sluice-boxes, but requires to be put through the stamp batteries like the quartz from the lodes. The gold mines of the Black Hills are so situated, far up on the hills, that the ore can be carried directly into the stamp-mills by chutes, and hence, though the gold ores are of low grade, averaging not more than \$10 or \$12 per ton, the cost of reduction is so small, ranging from \$1.80 to \$4.50 per ton, that the profit on these uniform low grade ores is better than is obtained on ores of higher grade, which cost more for reduction.

Where the ores contain gold and silver in combination with copper, lead, or zinc, and sulphur, a more active, expensive and protracted treatment is necessary; but this belongs rather to silver than gold-mining. Where the raw amalgamation and wet crushing process described above is all that is necessary, gold can be reduced from the quartz for from \$3 to \$5 per ton, and thus, unless the transportation is too expensive, it is possible to reduce low grade ores, those containing from \$15 to \$20 of gold

to the ton, and make a fair profit on the business. The plant or first cost of a stamp-mill of five, ten, or even twenty stamps is not now so great, as to deter the owners of a good mine from setting it up; or if it is the property of parties who are not miners but who understand their business, two or three mines of moderate size can keep it constantly employed. By this process, while from seventy to seventy-five per cent. of the gold is saved, much, generally all, of the silver is lost, and the whole of the copper, lead and zinc.

Silver was first discovered, in any considerable quantity, in these States and Territories, in Nevada in 1857 by the Grosh brothers; but owing to its being largely combined with gold, and the death of the discoverers soon after, the discovery was not prosecuted at first very vigorously. In June, 1859, the first great discovery of silver was made on a part of what is now known as the Comstock lode, the grounds of the Ophir Mining Company. Peter O'Reilly and Patrick McLaughlin were the discoverers, but as the land was claimed by Kirby and others, they employed Henry Comstock to purchase the land. Comstock negotiated at the same time one or two other claims, and finally purchased the whole tract, to which he gave his name, but appreciated its value so little, that he sold it for a few thousand dollars, and regarded himself as having made an excellent bargain. From that Comstock lode or vein, more than three hundred millions of dollars have been taken since that time—a period of twenty years.

Silver is found in all, or nearly all, the different systems of rocks forming the crust of the earth, from Azoic to Tertiary. Like the gold and gold ores, it is found only in veins, though these are sometimes of great width, the Comstock lode varying from twenty to one hundred and fifty feet.* The depth of these veins, like those of the gold, has never been ascertained, but it is known in some cases to exceed 2,650 feet. The ores contain the silver in various conditions and combinations. In Nevada, it is com-

* Since the partial failure of these veins, and the discovery of contact lodes at Leadville, the idea is gaining ground that a part of the deposits of the Comstock, and especially those veins a hundred and fifty feet wide, may be contact lodes.

bined with a certain proportion of gold, and is found as a sulphuret of silver and lead (argentiferous galena), a sulphuret of silver and copper (copper pyrites), of zinc, and combined with sulphurets of iron, antimony, tellurium and other base metals; as native or virgin silver; as chloride of silver or horn silver; as a richly argentiferous carbonate of lead, copper, zinc or iron, and in yet other combinations, which can only be reduced by long and tedious labor and at great expense.

A large proportion of the silver from the mines on the Comstock lode can be reduced by the dry stamping and amalgamating process. These are those in which the percentage of lead is small and that of gold large. In these cases the lead is lost, but the reduction costs only from four to five dollars a ton. Ores containing more lead, or copper, zinc, etc., are variously treated by roasting, smelting, treating with copper, iron, or "lead riches," mixing with salt to change the sulphurets into chlorides, chlorodizing, leaching, melting in a reverberatory furnace, etc. The ores of Colorado are partly sulphurets and partly carbonates, and in some of them there is a large amount of native silver. The Utah ores are very largely chlorides or chlorides and sulphurets, with some "horn" or native silver; some of the California ores of more recent discovery are carbonates. Those of Montana are mostly sulphurets, but mingled with such a variety of base metals and in such a condition that the reduction is effected with great difficulty. Indeed until the recent establishment of the Alta Montana mill and works at Wickes, most of the ores from the Montana mines have been only concentrated, and sent out of the Territory for reduction. The Alta mill concentrates, and employs seven or eight different processes of reduction, all of them expensive and requiring costly and complicated machinery. Ores are reduced by these processes at a cost of from \$15.75 to \$50, so that low grade ores do not pay for mining, if they contain much of the base metals.

It is not necessary to occupy our pages with minute description of these various processes, or the machinery constructed for them. They can only be worked by experts, and the great competition for business in the numerous reduction establishments secures the miner against exorbitant prices.

It is difficult to say which are absolutely the *best* mining regions. There are advantages and disadvantages about them all, to the practical miner or the resident mine-owner. In those mines which have been established from fifteen to twenty-five years, like many of those in California and Nevada, the shares are high priced, if the mines continue to be valuable; the depth of the mines is so great, and the danger of the accumulation of water so constant, that the expenses are enormous, and large as the dividends are, the assessments made on the shares for improvements nearly equal, and in some cases exceed all the declared profits. There are, indeed, all the appliances of civilization, and the miner or mine-owner is not subjected to the hardships and privations, from which those suffer who attempt to open mines in a new country. Placer mining is best adapted to the young and enterprising miner who has little or no capital. He needs at the outset only his tin or iron pan, his pick and shovel and perhaps a little quicksilver, and his haversack of provisions—yes, besides these he needs sufficient knowledge of mining to know where he will be likely to find a place with a moderately rapid stream of water at hand, and when found, to determine whether it will pay for working, or whether its best pay streaks have already been worked over. Even if his gains are but moderate at first, they will increase under favoring circumstances, till he can substitute the “Tom” for his pan, and the sluice for the “Tom,” and employing help can increase his income rapidly. But placer mining is, in its nature, very uncertain. The miner may come upon barren spots where there is no pay-dirt, and his little hoard is fast becoming exhausted; or, which is worse, he may come to the end of the placer, or, as in the Black Hills, may find it a hard lava-like mass, agglutinated and firmly cemented together by the oxide of iron, which he cannot wash away nor pulverize, and hence, like the tramp, he is obliged to move on. Meantime his life is of the hardest and roughest, his dwelling is either a dug-out in the side of a hill, or a sod-hut, reared and roofed by his own unskilful hands; his food is hard, coarse, and badly cooked, for he cooks it himself, as best he can; he is much of the time in wet clothing, in his work of washing the gold.

without society, without books, without a Sabbath or any religious privileges. After a longer or shorter time, the placer gives out, and he must find another. What he has saved of his gains he has, but there is no right, no claim, to be disposed of; he can only pull up stakes, and begin again. For placer mining the Black Hills, Western Colorado, Montana, and perhaps some portions of Wyoming, and Idaho, Oregon, and Washington Territory, offer the best locations.

For lode or vein mining more capital is needed for success; and a practical knowledge of mining is almost indispensable. It makes little difference whether the miner seeks a gold or silver lode; he must be sure of these four things: that he is not on land already claimed by anybody; that any apparent vein he may discover is a true fissure-vein, and not a placer-deposit, nor a mere pocket; that the dip of the vein is such as to permit its successful working; and that the ores are of a sufficiently high grade to pay the costs of reduction and leave a small margin of profit. Here again the privations in the mode of living come in, and unless the miner has considerable capital, he is liable to see his money and his hard toil both go for little or nothing, and the great rewards for which he hoped, pass into the pockets of some one who has more money but less brains than himself; when he has reached the end of his means, and is obliged to sell at any price which the avarice of the buyer will prompt him to give.

If he can hold out and hold on, and enlist sufficient capital to assist in the full development of his mine, there is a fortune before him, but in all the mining regions there are not two dozen well-developed mines, of which the original discoverers are still proprietors. Most of these mines have from \$150,000 to \$5,000,000 or more invested, and even these gigantic capitals do not always yield a profit. In California, Nevada, Utah, and even in the newer mines of Colorado, Montana, and the Black Hills, capitalists stand ready to gobble up any promising mines, paying always the lowest prices at which they can be bought, but developing them as speedily as possible, by a lavish expenditure for machinery and appliances, and by sinking lower levels

in the mines. In Nevada the bonanza kings own all the best mines, and work them together or separately. In Colorado a group of millionnaires, or rather, as "Josh Billings" would put it, ten-millionnaires, have obtained control of all the richest mines around Leadville; in the Black Hills one gigantic California firm own all the valuable mines on the great Belt near Deadwood, and stand ready to purchase any other promising mine. In Utah and Montana Eastern capitalists control the largest mines.

For the skilful mining engineer, or the intelligent practical miner, if he prefers gold mining, the Black Hills, Colorado, New Mexico and Arizona offer the best fields, and perhaps Oregon and Washington Territory furnish some good opportunities for industrious and skilful men. For silver mining, Colorado, possibly Nevada, Arizona, Utah, Montana, New Mexico, and perhaps Idaho. Texas may yet develop some good mines of gold and silver, but there is thus far nothing specially attractive there. California is not opening many new mines, and the old ones have little need of new-comers.

To capitalists desirous of investing in mining enterprises, we have no advice to offer. They have generally their own ideas about such investments: if these ideas are correct, they will be successful; if not, so much the worse for them.

CHAPTER X.

OTHER METALS AND MINERAL PRODUCTS—QUICKSILVER—COPPER—LEAD AND ZINC—IRON—PLATINUM—TIN—NICKEL—IRIDIUM AND OSMIUM—TELLURIUM—ANTIMONY—ARSENIC—MANGANESE—SULPHUR—BORAX—SODA—SALT—COAL—WOOD AND CHARCOAL AS FUEL—MINERAL SPRINGS.

MERCURY or quicksilver is found rarely in its native or metallic state, but generally as cinnabar or sulphide of mercury, abundantly at many points in the Coast Range of the Pacific coast, but is only mined and reduced to any considerable extent in California, where the New Almaden and the New Idria mines will probably exceed the great Spanish mines from which they

take their names. Several other mines in the vicinity of these are in operation, and whenever there is an increased demand for the metal, will prove profitable; but now that the long litigation which closed the two principal mines for a number of years is settled, their production will greatly increase. The opening of so many new gold mines, and the great extent to which hydraulic mining is now carried, insures a prompt market at paying prices, for all the quicksilver which these mines can produce, for thus far the reduction of gold without quicksilver has been found impossible. There are large deposits of cinnabar, apparently inexhaustible, in Washoe and Nye counties, Nevada, in Utah, and alleged discoveries of it have been made in Oregon and in Arizona.

Copper.—The ores of this metal, and the native metal itself, though not in large masses as in the Lake Superior region, are found in nearly every State and Territory of the Great West. It is found in all forms; without admixture with other metals, as malachite, the beautiful green carbonate of copper, the red, blue, gray, yellow, and vitreous carbonates and oxides, as copper-glance, tetrahedrite, and in every other known form of crystallization; as copper pyrites in combination with gold, and in various proportions, in combination with silver, both in the carbonates and sulphides.

There are hundreds of copper mines in California, the metal occurring in some form in nearly every county in the State. Some of these have proved unprofitable, owing to mismanagement, distance from market, and difficulty or impossibility of their reduction near home. Recently improved methods of smelting have been introduced in California and other States, and it is no longer necessary to ship the ores to Baltimore or to Swansea, Wales, to be reduced.

Arizona is very rich in copper ores, and they can be very easily worked. They yield from thirty-six to sixty per cent. or more of pure copper. Some of them are already sending large quantities of block-copper to San Francisco. Nevada has an abundance of copper, but it is mostly in combination with the silver. The copper veins of Northern California extend into

Southwestern Oregon, and are even richer there than in California. Copper has also been discovered in Eastern Oregon. Washington Territory has its full share of copper, though its mines are as yet undeveloped.

Both Idaho and Montana are rich in copper, both in combination with silver and alone. Montana parts her copper from the silver in some of her smelting-works and ships it to the East.

So far as yet discovered, the copper in Dakota, at the Black Hills, is mostly combined with gold and silver, but deposits of it, not thus alloyed, may yet be discovered. In Minnesota the great copper field is around the shores of Lake Superior; the copper deposits of the Ontonagon district in Northern Michigan, dipping under the lake, and reappearing on the Western shore.

Proceeding southward, Iowa has some copper, but not developed. Missouri, large beds of it, formerly worked extensively, but now of such low grade as not to be profitably exploited; Nebraska only a small deposit in the southeast; while Kansas, which abounds in lead and zinc, has not yet developed any copper. Wyoming is abundantly supplied with most of the ores of copper. In Colorado, from \$90,000 to \$120,000 value of copper, parted from silver and gold, is sent to market every year. There are also mines of copper alone. But New Mexico, while all her mines of gold, silver and lead are rich, excels all the other States and Territories of the West in the wealth of her copper mines, which are now in a fair way to be developed on a large scale. Arkansas has large deposits of copper ore among her other mineral wealth; it is found, though not developed, in the Indian Territory, and Texas can furnish a supply, not only for all the copper-heads, but for all the copper-bottoms of the world.

Lead is as widely diffused as copper; perhaps even more extensively. Wherever silver is found, lead is almost invariably present, either as sulphuret (galena), carbonate, or oxide. And where silver is absent, or present only in infinitesimal proportions, as in Kansas, Minnesota, Iowa, and Missouri, and in some of the mines of Wyoming, Dakota and Montana, the lead puts in its

appearance, as sufficient of itself, without the more costly metal. The quantities of it parted from silver are enormous, the supply from two districts of Nevada alone being nearly sufficient for the American market, and that of Colorado nearly a million of dollars annually. The other great mining regions add to this vast total, and Kansas, Missouri, Iowa, and other States east of the Mississippi, aid in rolling up an immense aggregate. Fortunately the demand for lead is great and constant, not limited to the arts of war and the slaughter of game, but extending also to many of the arts of peace, being used in rolls, sheets, and piping and tubing, furnishing the basis of nearly all of our paints, and of many of our drugs.

Zinc is not quite so widely distributed, but is often found in combination with silver and lead. It is also found by itself, or with lead in the form of sulphuret (Blende), silicate (calamine), or carbonate (Smithsonite). It is mined and reduced quite largely in Kansas, and to some extent in Missouri and California.

The resources of our Western Empire, for the production of *Iron* and *Steel*, have no parallel on the globe. No one of the States and Territories composing it lacks deposits of iron ore, in some of its many and varied forms; and in many of them it is found of such excellent quality, and in such immediate proximity to coal-beds, and the necessary fluxes, that the cost of production is reduced to the lowest minimum. The great railways which traverse the continent can have their iron and steel rails manufactured within 500 feet of their tracks, and of such quality as cannot be obtained at any price abroad. The mountains of iron ore yielding from fifty to ninety per cent. of the pure metal, which are found in Missouri, Utah, Oregon, California, Wyoming, Texas and Montana, only needed the present demand for iron and steel to stimulate their development, and in a short time there will be enough iron and steel, of the best quality, produced in these States and Territories, to supply not only all the iron and steel rails (and it is estimated that nearly 2,000,000 tons of these will be needed the present year), but all the machinery for mining, milling, manufacturing and agricultural purposes, all the

iron and steel for steamers and ships, whether for commerce or naval purposes, all the steel guns, all the bridges, all the buildings, all the hardware, car-wheels, cutlery, and all of both metals that is needed for any other purpose under the sun, not only within the limits of our Western Empire, but all the world over. Duty or no duty, neither England nor any other nation of Europe can compete with furnaces, where the ore, fluxes and coal can be thrown directly into the furnace through chutes, without handling, and the prime cost of all the material and its conversion into steel, need not exceed from \$10 to \$12 per ton, while the product is of the very best quality. But the first cost of the establishment of these furnaces, and the rolling-mills, machine-shops, foundries, etc., etc., is very large, and requires, and will require, the investment of many millions of capital, though, once under way, the returns will be enormous, and the rapid growth of these establishments will be gigantic. European capitalists are already transferring their furnaces and workmen to this country in large numbers, and they are wise in doing so. Within the next five years there will be a demand for the services of every skilled worker in iron and steel who may land in this country, and at good wages.

The consumption of iron and steel, of our own production, and imported from abroad in 1879, was 4,410,000 tons, of which 510,000 tons were imported; we are perfectly safe in predicting that, in 1889, it will exceed 12,000,000 tons, and all of it will be raised from our own mines, and smelted in our own furnaces.

Platinum is found pure, and in combination with gold, iridium and iridosmin on the coast of California and Oregon, and in some of the gold mines of Colorado and Arizona and perhaps elsewhere. The quantity is not large, indeed it is a rare metal everywhere, the Russian mines, which furnish from 4,200 to 5,000 pounds annually, producing about four-fifths of the whole amount yielded by all countries. The whole quantity produced in the United States does not probably exceed 450 or 500 pounds. Mr. Edison, the inventor, in 1879 desired to use platinum wires for holding the carbons for his divided electric

lights, and addressed inquiries to all parties connected with gold-mining operations in regard to a possible or probable supply of the metal. He found that it was much more widely diffused than had generally been supposed, but that it was found in such small quantities that any considerable increased demand would enhance the price beyond the limit which he could afford to pay, and he substituted a less expensive material for it. Platinum is now worth from \$70 to \$75 per pound.

Tin is not found in large quantities in any part of the United States, but the greater part of what does occur is in California, Nevada, Idaho, Missouri, Arizona and Texas. It is also found in the State of Durango, in Mexico. It is mostly found in its best form as cassiterite or oxide of tin, and is classed as mine tin, stream tin, and wood tin. This ore contains about seventy-eight per cent. of pure metal. The entire production of the world is from 28,000 to 30,000 tons, of which more than three-fifths comes from the East Indies, from Banca and the straits of Malacca. The American production is not sufficient to exert any appreciable influence on the market.

Nickel, which is now becoming a metal of so much economic value in the useful arts, is found in our Western Empire, as elsewhere, in combination with several of the ores of iron. It forms but a very small constituent in these ores, from two to five per cent., and occurs oftenest in the argillaceous ores. By proper treatment of the ores, it is removed in the slag, and is concentrated by various processes till the *matte* contains about thirty-five per cent., when it is dissolved out by acids. Its use in electro-plating is very important in the arts, and requires considerable skill in its successful manipulation. Nickel in a pure state is worth about \$3 a pound.

Iridium and *Osmium*, or rather the compound known as *Iridosmin*, which contains both metals, and usually a small percentage of rhodium, and sometimes ruthenium, is found in small hard grains and sometimes in scales, in the placer deposits, and associates with platinum. The alloy is the hardest of known metallic bodies, and is infusible except under the oxy-hydrogen blow-pipe. The iridosmin is used in its native condition for pointing the nibs

of gold pens, being as nearly as possible indestructible either by accidents, or by the chemicals in the ink, and being very hard. Only the rounded particles are suitable for this purpose, and these constitute only from one-fifth to one-tenth of the whole. The price a few years since was \$250 per ounce. From three to eight ounces are obtained at the Assay offices in the melting of one million of dollars of gold. The iridium, when isolated, furnishes the basis of a black used in decorating porcelain, which when baked in, is indestructible.

Tellurium is found in combination with both gold and silver as tellurides of those metals. It belongs to the same class of elementary bodies as sulphur, and imitates it in most of its compounds. It has little economic value, but is a great source of annoyance in the reduction works, in California, Colorado, and Montana, from the intensely poisonous and fœtid properties of its compounds. It is found sparingly in most of the larger gold deposits.

Antimony, *Arsenic*, and *Manganese*, are found as sulphides, sulphates, carbonates, oxides, and in rarer forms, in combination with silver, copper, lead, zinc, and iron, sometimes impairing, at others enhancing, the value of the compound. In most cases the antimony and arsenic are expelled in the smelter's furnace. The manganese in its combination with iron is, to a certain extent, beneficial.

Sulphur, in the form of sulphides and sulphates, is present in a large proportion of the silver, lead, copper, zinc, and iron ores. But it is also found in a native state in large masses or deposits, in those portions of California which were formerly subject to volcanic eruptions, in Humboldt county, in Nevada, at several points in Utah, especially in Millard county, where the deposit is more than twenty feet thick; at Brimstone Mountain in the Yellowstone Park region, in Dakota, New Mexico, Arizona, and Texas. Sulphuric and muriatic acid are produced at some of the smelting works from the sulphurets of iron, copper, and lead; while the sulphates of soda, magnesia and potassa, are obtained in a nearly pure state in the alkaline lakes of California, Nevada, Utah and Wyoming. The sulphate of lime (gypsum or plaster

of Paris) is found in extensive deposits nearly or quite pure, in almost every State and Territory of the region, and in California, Colorado, Texas, and perhaps elsewhere, it assumes also its beautiful forms of alabaster and selenite. The sulphates of zinc, copper, and iron, if they do not exist naturally, are easily formed by the reduction of the sulphurets of those metals.

Borax (chemically the biborate of soda) is found at several points in California and Nevada, in the mud and the water of alkaline lakes; and is now produced of great purity, and in such large quantities as to have revolutionized the market, and caused the price of the article at retail to fall from fifty or sixty cents below twenty cents per pound. It is either gathered in crystals, evaporated from the water, or procured from the mud, by washing or by lixiviation. The supply seems inexhaustible, though the demand has greatly increased since the market began to be supplied from the Pacific coast.

Soda, both as caustic soda, and carbonate of soda or pearlash, and also as sulphate of soda or Glauber's salts, exists naturally in the Great Salt Lake and its vicinity; at several places in California and Nevada, and in the alkaline lands. It is also found in the Yellowstone region and in Texas. That found in Utah is so nearly chemically pure as hardly to need refining.

Salt.—This invaluable mineral is widely diffused over this vast region. On the shores of the Pacific it is procured by solar evaporation and boiling. All over California there are salt springs, and in many places salt lakes, from which incrustations of nearly pure salt can be gathered. In Nevada it is found in large bodies in the beds of desiccated lakes, in the waters of salt lakes, and in mountain deposits. In Utah, the Great Salt Lake is a saturated solution of common salt, five gallons of it yielding one and three-fourths gallons of crystallized salt. It is now manufactured largely from the waters of the lake, and much is produced by natural solar evaporation. Rock-salt, much of it almost perfectly pure, is mined in Salt Creek Cañon and on the Sevier river. The northern part of Utah abounds in salt springs, which pour their waters into the Salt Lake. Wyoming has also its salt deposits, as well as Kansas and Nebraska, many of them

in the form of brine springs. Arkansas, the Indian Territory, and Texas have also brine springs, salt lakes, and deposits of salt. Arizona and New Mexico have salt deposits and salt lakes. The supply in most of the States and Territories now exceeds the demand, but the growing requirements of the smelting and reduction works for it, in the reduction of pyritous ores, and to some extent the carbonates also, as well as its use for domestic and packing purposes, insure a future demand which will require the erection of additional salt-works.

Coal is found at many points in this vast region, and of many different qualities. There are four distinct coal-fields between the Mississippi river and the Pacific ocean, and they comprise an area of more than 200,000 square miles. The first of these coal-fields extends from Iowa, in which State it covers a large area, through Missouri, Eastern Nebraska and Kansas, Arkansas, the eastern portion of the Indian Territory, and Eastern Texas. This is called the Missouri coal-field. It is a bituminous coal, from the middle coal measures of the carboniferous system, in many places of excellent quality, and belongs to the class of coking coals, being valuable for heating and smelting purposes. The total area of this coal-field is somewhat more than 47,000 square miles, or a little larger than the State of Pennsylvania. The second of the coal-fields begins in British America, near the Saskatchewan river, and passes southward through Dakota, Eastern Montana, Western Nebraska, and Kansas, and Eastern Wyoming, through Colorado, east of the Rocky Mountains, Northeastern New Mexico, and Central and Western Texas. It is a lignite coal, belonging to the cretaceous period, and in some parts of its course yields a very fair heating coal, furnishing some gas, but not coking. In some of the places where it is mined, it assumes the characteristics of a cannel coal, though of inferior quality. It covers an area of about 40,000 square miles, but much of it is too deep for successful mining, especially as the quality of the coal is not of the first class.

The third coal-field is a very remarkable one. Like the second, it commences in British America, passes through Western Montana and Idaho, through Western Wyoming and Utah,

through Western Colorado and New Mexico, and perhaps Eastern Nevada, through Arizona and Northwestern Texas, and into Mexico. Like the second coal-field, it is a lignite, but of the tertiary instead of the cretaceous period, being found at the north only in the miocene, but in Texas, principally, in the eocene rocks. In Western Colorado, in Utah, and in New Mexico, near Santa Fé, volcanic action has changed it into an anthracite coal, that in New Mexico being of a quality nearly equal to that of the Pennsylvania mines. The coal-beds of La Plata county, Colorado, in the vicinity of Animas City, have recently proved to be anthracite, probably tertiary lignites changed by volcanic action. At other places, as in parts of Utah, it has been changed into a semi-bituminous coal. Some beds of it coke and give evidence of being good smelting coals.

The fourth coal-field is in reality two coal-fields which interlock, the one, lignites of the tertiary, which pass through Eastern Washington and Oregon, and in California appear on both sides of the Coast range; the other, coming from Alaska, and furnishing on Vancouver island and in the Straits of San Juan de Fuca some mines of excellent bituminous coal, and passing down the coast of Washington and Oregon, growing constantly poorer and more charged with sulphur, become, in California, interlaced with the deposits of the tertiary lignite. At one or two points, as at Monte Diablo, they yield a fair quality of bituminous coal. The last-named branch of this coal-field is found only in the cretaceous rocks, and as it approaches former or recent centres of volcanic action changes, as on Vancouver island, to a semi-bituminous coal, and in the Queen Charlotte islands, off the coast of British Columbia, to a true anthracite of excellent quality. This double coal-field covers nearly 60,000 square miles, and the preceding one over 50,000. The San Francisco market is supplied with cannel-coal from England and Australia; bituminous and semi-bituminous from Chili and Vancouver island; anthracite from Pennsylvania and Queen Charlotte islands; Cumberland and other bituminous coals from Pittsburgh, Leavenworth and Wyoming, and Pacific coast lignites from Bellingham Bay, Washington Territory, Coos Bay, Oregon, and Monte Diablo in Cali-

fornia. The Colorado and New Mexican coals will also appear in its markets as soon as a more direct railroad communication is established.

In many portions of this vast territory, where fuel for smelting purposes is required either for the reduction of the precious metals and lead or copper, or for the production of pig-iron and Bessemer steel, the forests are still so dense and convenient that wood or charcoal is cheaper than coal. But other sections are obliged to rely upon coal and upon that which can be coked; and in some of the States or Territories, as for example in Nevada, these coking coals, or the coke made from them, are brought from long distances, and at a considerable expense.

Intimately connected with coal, geologically, are two other mineral products, *Asphaltum* and *Petroleum*. In California there are lakes, or rather marshes, which after the winter rains have a shallow depth of water on their surfaces, which are covered to a considerable depth with asphaltum, in varying degrees of hardness, some of it being of the consistency of molasses, and entangling the cattle, which are drawn thither by the hope of finding water, and perish in the sticky mass; nearer the edges it is hardened, and becomes the solid asphalt of commerce. These lakes or marshes are found in San Luis Obispo, Santa Barbara, Tulare, and Los Angeles counties. Some petroleum is found with them, but the best petroleum oils of California, and they are of excellent quality, are in Humboldt, Colusa, and Contra Costa counties, and in the vicinity of Monte Diablo; but all the coast counties have petroleum springs. Petroleum has also been discovered in Nevada, though it has not been developed. In Northwestern Colorado, on the White river, in and near the Ute Reservation, there are extensive springs and marshes of petroleum, asphalt, and mineral tar. There are also petroleum springs on the headwaters of the Arkansas river, near Denver. The petroleum region of Northwestern Colorado extends northward through Western Wyoming, Montana, and possibly Idaho. Recently extensive springs and wells of petroleum of excellent quality have been discovered and worked about ninety miles north of Point of Rocks, on the Union Pacific Railway, in Wyom-

ing Territory. The last report of the Union Pacific Railway, presented in March, 1880, says that the supply is apparently inexhaustible; that it is used extensively on the railway, and that it will probably be shipped eastward and westward in large quantities, as soon as arrangements can be made for its transportation. Petroleum and beds of mineral or paraffin-wax have been discovered in Utah, in the vicinity of the Spanish Fork cañon. The mineral wax is of the same quality of that found in Galicia, Austria. In Kansas there are numerous gas-wells, some of them furnishing a sufficient quantity of illuminating gas to light a city of 30,000 inhabitants. These indicate the existence of reservoirs of petroleum below the shales or bituminous rocks, through which the wells are bored. There are also indications of the presence of petroleum in Missouri, Arkansas, and Texas.

Of other mineral products, not already noticed, we may mention mica, which is found in extensive deposits, though not yet in very large sheets, at numerous points in the Rocky Mountains, as well as in the Cascade Mountains; alum (sulphate of alumina) found in great quantity and nearly pure, in Utah; kaolin and other porcelain clays, and the finest of glass-sand in all the States and Territories west of the Rocky Mountains. Most of the silicates are also found in combination.

But aside from the mines of the precious metals, nothing in the mineral world has excited so much interest in all parts of this vast region, as the abundance and variety of its mineral springs and geysers. The known geysers, some of them the most remarkable yet discovered anywhere, are found in California, in the Yellowstone Park, and near the headwaters of the Yellowstone, the Jefferson, Madison, and Gallatin rivers. This region, like that in California, has been the scene of volcanic action. In our description of the Yellowstone National Park, we shall give a detailed account of these and other remarkable phenomena, found in that true wonder-land. But the springs thought to possess medicinal or healing virtues are myriads in number, as well as in character. Some, like the scores of Hot Springs in Arkansas, Texas, Colorado, Nevada, California, Utah, Montana, and Wyoming, have no appreciable mineral constituents, but owe

their healing properties either to their thermal quality (the heat ranging from 95 to 225° F.) or to some not fully understood electric influence, which is thought to pervade them; others, whether cold or warm, owe their reputed medicinal virtue to their impregnation with sulphur, iron, lime, potassa, soda, lithia, phosphorus, or some and perhaps several of the sulphates, carbonates, phosphates, nitrates, lithiates, chlorides, bromides, or iodides, or other compounds of metals, alkalies, and alkaline earths, and mineral acids, and generally the more nauseous and diabolic the taste and smell of these villanous compounds from Nature's laboratory, the greater the healing virtues they are believed to contain.

CHAPTER XI.

No very close approximation of the amount of arable lands in our Western Empire can be made. The reports of the Surveyors-General to the Land Office each year develop the fact that, in the newer States and Territories, thousands of acres, previously deemed incapable of cultivation, have been conquered by the enterprising settlers, and must henceforth be recorded as arable lands of extraordinary fertility. We have alluded to this, in our chapter on the Great American Desert; but it is a fact which will bear repetition and illustration. Nearly the whole region lying between the Mississippi river and the Rocky Mountains was regarded fifty years ago as a desert land, incapable of any considerable cultivation, and given over to the buffalo, the panther, and the prairie wolf; yet in no part of the vast domain of the United States, and certainly in no other country under the sun, is there a body of land of equal extent, in which there are so few acres unfit for cultivation, or so many which, with irrigation or without it, will yield such bountiful crops. The land lying between the Rocky Mountains and the Sierra Nevada or Cascade Range, has more mountains, and more grazing lands; some of it, too, is incapable of culture, and is more valuable for the mineral wealth which lies beneath the surface, than for any crops which can be raised from it. Some of these lands are volcanic,

and the lava and volcanic scorite have not yet been long enough exposed to the influences of sun, and rain, and glacial action, to render them fertile as they will eventually become. Of a considerable portion of this region, also, it may be said, that it has not yet been explored with sufficient thoroughness, to settle the questions whether it is best adapted to cultivation or grazing, or whether it is unfit for either.

Perhaps we cannot now come nearer the truth than to say, that, of the 2,028,000 square miles comprised between the Mississippi and the Pacific, from 750,000 to 800,000 miles may fairly be reckoned arable. Of this one-fourth, and possibly a little more, may require more or less irrigation, for some years to come, to bring out their highest productiveness; but this is regarded by the farmers themselves as an advantage, rather than a disadvantage, since by means of it, they are assured of large and excellent crops every year.

None of the States lying between the Rocky Mountains and the Mississippi river have much waste or unimprovable land. Missouri, Arkansas, and portions of the Indian Territory, and Northwestern Texas are more mountainous than the others, and have some grazing, and some sterile lands.

This whole region is well adapted to fruit culture. The apple of different varieties, and, to a less extent, the pear, flourishes from Minnesota to Arkansas; the peach from Iowa and Missouri to the Gulf; quinces from Minnesota to Kansas, and cherries and plums from Northern Dakota to the Gulf. Of smaller fruits, grapes, native and wild, as well as the cultivated varieties, are found everywhere, though the hardy species alone flourish at the North, whether wild or cultivated, while the more robust summer grapes (*Vitis æstivalis*), native and foreign, take their place in the South. The strawberry flourishes everywhere, but is six weeks earlier in Texas than in Minnesota. The raspberry, blackberry, currant, and whortleberry, are better adapted to the Northern and Middle States and Territories than to the South; but the papaw and the banana, the pomegranate, fig, orange,

lemon, and olive, are found in the South alone. In the way of nuts, the North has the chestnut, hickory-nut, black walnut, butter-nut, hazel-nut, and beech-nut; while the South has the pecan, the chinquepin, the filbert, the hard-shell almond, and can have the English walnut, and pistachio nut, if they will cultivate it.

Of textile fibres, hemp grows in all latitudes: flax mostly in the North, cotton, ramie, jute, tampico, agave fibre and cactus fibres in the South, while the dry, wiry grasses of the river bottoms of the Mississippi and its western tributaries, now coming into demand for paper stock, are mainly the product of the northern region.

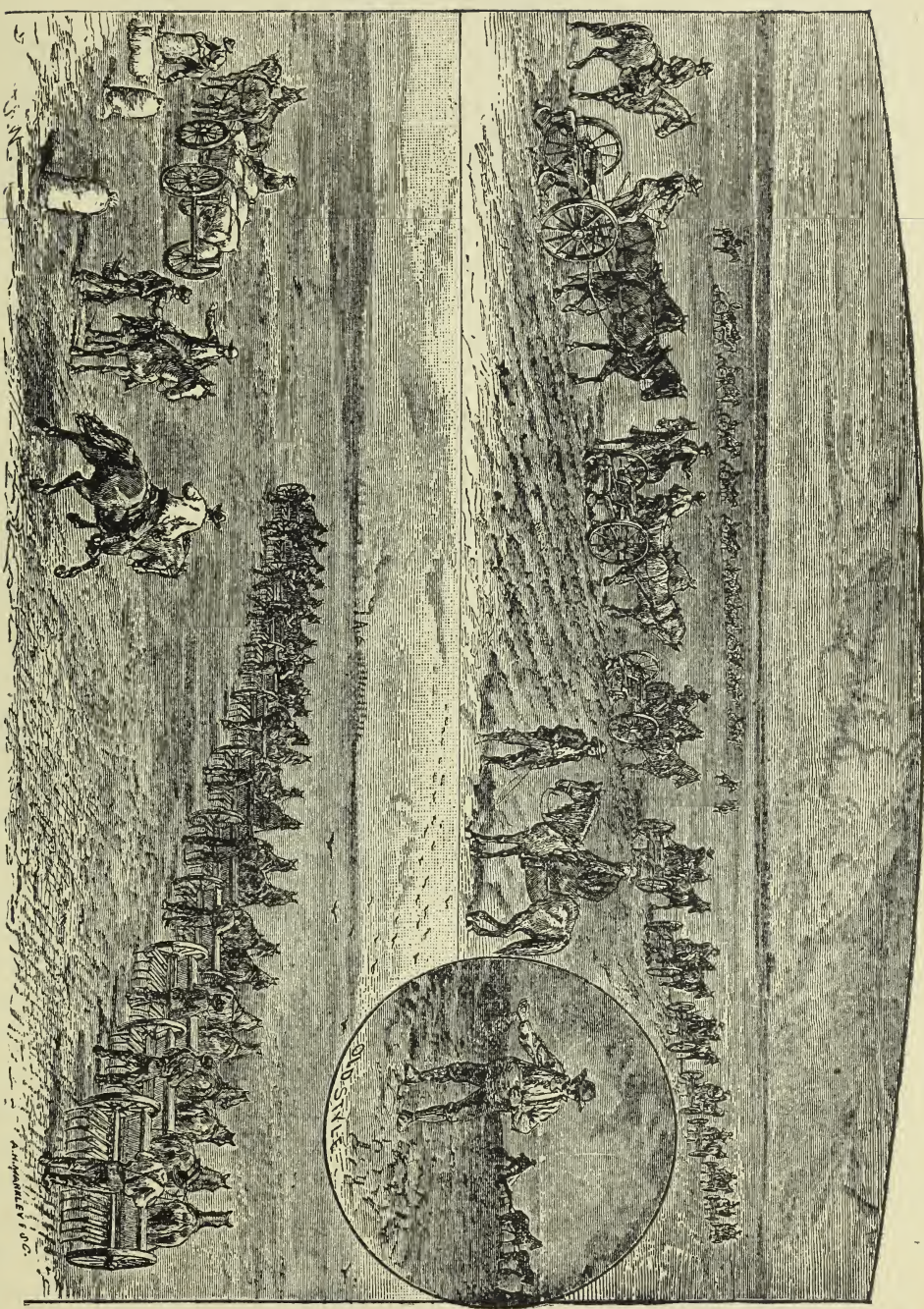
Tobacco grows in almost all latitudes, but Missouri, Arkansas, and Texas are the only States in which it is largely cultivated.

The Rocky Mountains consist of two, and a part of the distance, three principal ranges, having a general direction of north-north-west to south-southeast, and numerous spurs and out-liers connecting these ranges and extending from them westward. The eastern slope has no spurs extending eastward unless we except some hills of no great elevation in Wyoming. The Black Hills in Dakota, the Osage and Ozark Mountains in Missouri and Arkansas, belong to a different mountain system. While these mountain ranges have many peaks or summits from 13,000 to 14,000 feet in height, and some even higher, the table-lands from which the summits rise are generally from 5,500 to 8,500 feet in height, and most of the passes by which the ranges are crossed do not exceed that elevation. There are also many valleys and parks between the ranges, which contain fine tracts of arable land; but the greater part of the land included within these ranges is better adapted for grazing than farming; and considerable portions are only valuable for mining and the operations connected with it. The grazing lands of Colorado, Wyoming and Montana are mainly, though not entirely, on these mountain plateaux and parks; but the probabilities are, that there will be enough good farming-lands found in the valleys and parks, to supply the wants of the large mining, herding and non-producing classes who are even now filling up this mountain region with great rapidity. The wheat and other grains, Indian

corn, sorghum sugar, root crops, and vegetables, milk, butter, and cheese, and pork, can be furnished by the farmers, as well as most of the fruits, while the herdsmen can furnish the beef and mutton, and the sportsmen, the game, large and small ; but there will be little farm produce from the mountains to export.

Much of what is grown in the mountains will require irrigation, and with it will yield most bountifully. Even the best authenticated statements of the enormous crops produced by irrigation are received with incredulity. Seventy, eighty, and in some cases even one hundred bushels of wheat, not on one acre alone, but on a tract of thirty or fifty acres ; a like amount of barley ; eighty to a hundred and ten bushels of oats ; and from 150 to 200 bushels of Indian corn ; 400, 500, and 600 bushels of potatoes to the acre ; these amounts, incredible as they seem, are materially below what is claimed for these lands, some of which without water would have proved utterly barren and worthless. In Montana these mountain valleys do not lack water, the rainfall being there sufficient to produce good crops, and the whole region abounding in streams.

Between the western slope of the Rocky Mountain ranges and the eastern slope of the Sierra Nevada, or, as they are called in Oregon and Washington Territory, the Cascade Mountains, the character of the lands varies as you go southward from British Columbia. In the eastern part of Washington Territory and Oregon, the lands form generally a high, treeless plateau, moderately fertile, but, except in the river bottoms, generally better adapted to grazing than to cultivation. Farther south, within the limits of the Great Basin which includes nearly one-half of Utah and Nevada, the area of cultivable land is comparatively small, though by means of irrigation it is much increased ; considerable tracts are unfit even for grazing purposes, but these are generally good mining-lands. East and south of the Great Basin are the sources of the Grand, Green, San Juan and Little Colorado, as well as other smaller tributaries of the Rio Colorado of the West, and that great river itself. These all flow through Western Colorado, Southeastern Utah, Western New Mexico and Arizona, in such deep cañons that they leave many of the



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mesas and table-lands of these territories to drought and sterility, except where irrigation is possible, or when, as in the autumn and winter of 1879-1880, extraordinary and protracted rains deluged the country. Yet this region is well adapted to grazing, and by a scanty irrigation will yield the crops and fruits necessary for the sustenance of its inhabitants. In New Mexico and Arizona there are, with irrigation, a larger amount of arable lands than has hitherto been supposed.

Governor Frémont writes that, in the summer of 1879, a little band of Maricopa Indians, near Prescott, who had taken to farming, sent to San Francisco, over the Southern California road, ten car loads,—200 tons, of wheat of their own raising, which was of such excellent quality that it brought \$2.24 the hundred pounds when the usual market price was only \$2.10. The land on which such wheat could be grown, in an unusually dry season, must be counted arable.

West of the Sierra Nevada and Cascades, we find a fine agricultural region, Western Washington, Oregon, and California. This is the land of gigantic forest trees, the sequoias, the cedars, firs, and loftiest pines, the tulip tree, liquidambar and other forest trees, which have no rivals in the Northern Hemisphere. It is also the land of wheat and barley, of Indian corn and oats, of the vine, and its abundant wine product, as well as raisins of the best quality; and in its southern portion, of the orange, lemon and lime, the olive, the fig, the pomegranate, and the Madeira nut or English walnut, and the French and Italian chestnut. The latter is, in Italy, largely cultivated for the food-producing quality of its nuts.

The wheat crop of California is larger than that of any other State, ranging from 36,000,000 to 50,000,000 bushels annually, and is of the very best quality, bringing, in European markets, higher prices than any other. It never rains in harvest-time in California, and, on the large grain ranches, the giant header clips off the heads of the wheat, sweeps them into the huge wagon-box from which they are shot into the threshing-machine, which is geared on to the header, and the reaping and threshing are carried on simultaneously; while the grain as it comes from the

threshing-machine is sacked automatically, and the sacks are piled in heaps in the field, remaining uninjured in the pure, dry air, till they are sent to market or shipped for Europe. A large part of the crop is shipped in July. Barley is also a very important crop, California producing more than one-third of the whole barley crop of the United States, and nearly three times as much as any other State. Its product in 1878 was about 15,000,000 bushels, an average of twenty-three bushels to the acre, though forty to sixty bushels is not an unusual product. The production of oats is hardly sufficient to supply the State demand, being but 4,350,000 bushels in 1878, though considerable dependence is placed on wild oats, which are used largely for hay. Indian corn is also a small crop, about 3,500,000 bushels in 1878, or about thirty-five bushels to the acre. The Alfalfa and the various species of millet, including the pearl millet and the Dhourra or Egyptian rice-corn, are cultivated by the dairymen for fodder. Beans are largely grown. The root crops are more remarkable for enormous growth than for fine flavor. The sugar-beet yields several crops, and contains a high percentage of sugar. Hops are also an important crop, and other minor crops add to the aggregate of production. The fruits of California have a deservedly high reputation. The apple must yield the palm to those of Oregon, Washington, or the States and Territories farther East, but the pear, quince, peach, apricot, cherry, orange, lemon, pomegranate, fig, prune, plum, olive, currant, strawberry, blackberry, raspberry, banana, plantain, and pineapple all attain a high degree of excellence and a marvellous size.

In addition to the native grape and the Mission grape, both of which are very largely grown, every known variety of grape found in Europe or America is cultivated here, and both in the flavor and quality of the fruit, and the abundance of the yield, they all greatly surpass their product where they are native. The production of raisins was at first a partial failure, in consequence of incomplete drying, but having learned the art of drying these as well as most other fruits, the raisins of the sun, from California, in their recent samples, surpass those of any

other part of the globe. The dried-fruits of the State, after failures from careless drying, are now beginning to take rank with the best in the world. The California wines and brandies have not till recently attained to their best condition. They were too strongly alcoholic, fiery and heady, and were put upon the market before they had had sufficient age to ripen them. The conditions of climate and dryness were not taken into account by the wine-growers, and the Mission grape being largely used for wine-making, its peculiar, earthy taste impaired the value of the wine. These difficulties have been, now, in a great measure overcome, and the present and future vintages of California will compare favorably with the best wines of Europe, with the additional advantage of being purer. The California brandy, when it has a sufficient age, is preferred by connoisseurs to the best cognac. There is yet, however, a considerable importation, not only of French brandies, but of the lighter and cheaper French wines, especially clarets, which might be made there of really better quality than the imported wines.

Both Oregon and Washington Territory contain, besides their great amount of timber lands, and their extensive ranges for grazing, large tracts of fertile, arable lands. There is no lack of rainfall in the region west of the Cascade Mountains. At some points the skies weep too constantly for successful grain culture, but this very excess of moisture gives to the forests a more gigantic growth, and to the grasses a larger and more vigorous development. For the most part, however, Oregon and Washington are well adapted to the culture of the cereals. Even Eastern Washington and Oregon, formerly regarded as a desert and rainless region, proves, notwithstanding its whitish, alkaline soil, and its moderate rainfall, one of the finest wheat regions in the world. With deep plowing no irrigation is needed, and the wheat, large, full-berried, and of the very best quality, weighing from sixty-five to sixty-nine pounds to the bushel (the legal weight is sixty pounds), turns out from thirty to sixty bushels to the acre; many of the farms averaging from forty to fifty bushels for their entire crop. In 1879 the wheat crop of Oregon exceeded 10,000,000 bushels, and that of Washington

was about half as much, simply because there were not men enough to sow a larger crop. All the small grains, rye, oats, barley, and buckwheat are successfully cultivated there; oats yielding from seventy to eighty bushels to the acre. Indian corn is a tolerably sure crop in Oregon, but less so in Washington on account of the cool nights. The root crops yield enormously, and there is a ready market for them at good prices at home among the lumbermen, fishermen, and manufacturing population of the towns. Flax, though cultivated mainly for the seed, is of excellent quality, the lint being longer, finer and silkier than elsewhere. Of fruits, the apple and pear are unsurpassed, and most of the small fruits are successfully cultivated. Oregon apples, pears, and berries command a high price in the San Francisco market.

CHAPTER XII.

TIMBER AND LUMBER—TREE-PLANTING—THE FOREST GROWTHS IN DIFFERENT SECTIONS—CALIFORNIA FORESTS—HORTICULTURE AND FRUIT-CULTURE—FLORICULTURE—WILD FLOWERS—MARKET GARDENING.

As we have already seen, a considerable portion of this Great West is but scantily supplied with forest trees. In 1871, a careful estimate put down, in these twenty States and Territories, the woodland, as covering 198,124,802 acres; but in the nine years which have since elapsed, the demand for railroad ties and structures, for bridges, for machinery, partly of wood, for mines, for dwellings, and public buildings, and for export, has diminished this area by nearly or quite twenty-five per cent. Minnesota, Missouri, Oregon, and Washington, and perhaps Texas, and Arkansas to a moderate extent, are the only States or Territories that export lumber. Montana has good timberlands, but she is not as yet producing more than lumber enough for the home demand. Iowa, Nebraska, Dakota, Kansas, Wyoming, Colorado, Utah, New Mexico, Arizona, and Nevada, have not timber and lumber enough for their own needs, and are

obliged to import a large share of what is consumed. The Indian Territory has a moderate amount, but the adjacent railroads are fast consuming it. Idaho has considerable forests on its mountains, but much of it is not accessible. The gigantic forests of California have been so recklessly wasted, that she now imports largely of timber, lumber, and fire-wood. In the prairie States, liberal premiums have been offered for tree-planting by the State authorities; and the National Government, by their Timber-Culture Act and its amendments, have sought to promote the cultivation of forest trees. The railroad companies, which have large land grants, have also encouraged tree-culture. But though these efforts have led to the planting of some millions of trees, many of them die the first or second year, and the whole number planted, in six or seven years, bears but a small proportion to the annual destruction of the forests.

The forest growths differ materially in different sections. In the northeast, Minnesota and Northern Dakota, pine is pre-eminent, though there are some of the harder woods scattered through the forests. In Missouri, cottonwoods, and the *bois d'arc* or Osage orange, mingle with the other hard woods and pine and hemlock. Montana has pines and firs, and some oaks, black walnuts, maples, etc., etc. Oregon and Washington are remarkable in their western halves for gigantic firs, and have also a fair share of pines, spruces, red cedars, and sequoias. From these and the almost inexhaustible forests of Alaska, and British Columbia, the Pacific coast will probably draw its supplies of lumber and timber for many years to come. The forests of Eastern and Middle Texas, and Arkansas, are largely composed of hard woods; there are eight or ten species of oak, one an evergreen, though not the genuine live-oak; chinquapin, hickory, black walnut, cherry and ash; and in Northern Arkansas the tulip tree or yellow poplar, the sweet, sour, and black gum, cypress and the Osage orange, etc., etc. In Northwestern Texas, there are some forests of pine and fir. The mountains of Arizona, Colorado, and New Mexico, are generally covered, nearly to the snow line, with evergreen forests (pitch, yellow, and spruce pine), but the trees are not usually of such gigantic size as are

found on the Pacific coast. Along the streams the inevitable cottonwood, locust, buckeye, box elder (*negundo*), and maple, are found in moderate quantities.

The forest growths of California are (or rather were, for, except in a few of the counties, they are rapidly passing away) for the most part wholly unlike those of the region east of the Rocky Mountains. Its largest trees, the sequoias, are of the redwood or cedar family. The *Sequoia gigantea* has attained in some instances to a height exceeding 450 feet, and very few of them when their growth was attained are under 325 feet. The tallest now standing is said to be 376 feet in height. Their circumference is as remarkable as their height, ranging from eighty to one hundred and twenty feet. The largest now standing measures 106 feet in circumference at its base. The *Sequoia sempervirens*, or redwood of the Coast Range (the *Sequoia gigantea* is only found on the western slope of the Sierra Nevada), is but little smaller than the *Sequoia gigantea*; often attaining a height of 300 feet, and a circumference of from sixty to eighty feet. The sugar pine (*Pinus Lambertiana*) and the Douglas' spruce (*Abies Douglasii*) both attain a height of 250 to 300 feet, with a circumference of forty to forty-five feet. The California yellow pine (*Pinus ponderosa*) is often 225 feet high. Sabine's or the nut-pine (*Pinus Sabiniana*), the western balsam-fir (*Picea grandis*), and the white cedar (*Libocedrus decurrens*) all attain a height of 150 feet; and among the deciduous trees, the burr oak, and the western chinquapin, one of the chestnut family, reach 125 feet. Many other trees unknown at the east, some of them semi-tropical, are 100 feet or more in height. Two of the oaks are evergreens.

The trees planted or raised from the seed, under the Timber, Culture and other acts, have been almost entirely of the rapidly growing kinds, the cottonwood, the ailantus, the locust, the Osage orange, the vine, maple, and white maple, etc. Few of these have much value for timber, but most of them are good for fuel, and some make moderately durable railroad ties. There must be added, however, to this list of trees, planted by settlers, one which is likely to prove of great value in a sanitary point of view,

as well as eventually as a timber tree, the *Eucalyptus globulus*, a tree which has the reputation of arresting the progress of marsh miasms, and of rendering the regions in which it is planted healthy. Unfortunately, this species is not hardy above latitude 39° or 40° north, but some of the other species of *Eucalyptus* may be less susceptible to the cold. One species, found in Australia, contests with the *Sequoia gigantea* of California, the title to be considered the largest tree in the world. It is said to be at least of greater circumference.

In the newer portions of this vast region, the farmer has been so intent on bringing the greatest possible amount of his grain or root crops to market, that there has been comparatively little opportunity for developing æsthetic taste in the cultivation of a flower-garden; and yet in sections where two years ago the sod was unbroken, the grounds around the often humble cabin or sod-house give evidence of refinement in the variety of flowers already blooming there. In Iowa, Missouri, Minnesota, Nebraska, Kansas, Texas, California, Oregon, Nevada, and Eastern and Central Colorado and New Mexico, the flower-gardens are often gay with beautiful flowers, of kinds unknown at the East, and as often redolent with the sweetest perfumes. Many shrubs, which at the East are hardly half-hardy, and cannot in our climate be preserved through the winter, on the Pacific coast and in Texas, become trees of twenty or thirty feet in height. Among these we may name the fuchsia of several species, with its beautiful flowers of crimson, white, scarlet, yellow and blush; the heliotrope, with its rich perfume, which becomes a flourishing tree; the mignonette, the smilax, here so delicate, there a hardy climber; the magnolia grandiflora, the syringa, there a stately tree, the lily family, etc., etc.

Wild flowers of great beauty and fragrance abound throughout all this region, except the alkaline or sage-brush lands, the Llano Estacado and the dry *mesas* of Arizona, and the two latter during and after the scanty rains, are resplendent with brilliant blossoming verdure, and during their dry seasons, the cacti, though of uncouth and ungainly forms, produce flowers of gorgeous hues, and some of them of wonderful beauty.

As to kitchen and market-gardens, they are found most abundantly in the neighborhood of the towns and cities. A large proportion of them are cultivated by Europeans, the Germans, perhaps, being most numerous among the larger market-gardeners. Their products are of almost unlimited variety: cabbage, cauliflower, kohl-rabi, onions, leeks, garlics, early sweet corn, sweet potatoes, the common potato of many varieties, yams, okra, gumbo, asparagus, celery, spinach, and other greens, vegetable oysters, egg-plants, radishes, lettuce, artichokes, turnips, beets, mangel-wurzel, ruta-baga, carrots, parsnips, squashes, pumpkins, muskmelons, watermelons, citrons, cucumbers, gherkins, peppers, the flavoring plants, thyme, summer-savory, sage, endive, peppergrass, water-cresses, parsley, orange leaves, bay leaves, etc., etc. Many of them deal also in the small fruits in their season. To those who have been accustomed to this business in Europe or in the Eastern States, there is a fine field for enterprise here; a very few acres of the fertile soil are sufficient, and for some years at least, and in most cases for one or two generations, no manure beyond that made upon the place will be needed, only deep and thorough tillage, to produce such vegetables as cannot be produced elsewhere.

WE have already spoken of the cultivation of the Minnesota early amber-cane, or sorghum, and of the great impulse which has been given to its culture within two years past by the discovery that it contains its largest proportion of sugar, and almost its only crystallizable sugar, when it is ripe; and have shown that not only can the seed be saved by waiting till this time, but that the yield of sugar is so large, and is produced by such simple processes, that it is the most profitable crop a farmer can raise, and will materially diminish, if it does not entirely abolish, the necessity of our importing immense quantities of sugar from the West Indies, Demerara, Brazil and the Sandwich Islands. Our importation of sugars now costs us \$100,000,000 annually. We may be, within ten years, and possibly within five, exporters instead of importers of raw sugars.

It has been ascertained that the stalks of our Indian corn yield, when the corn is ripe, about seventy-five per cent. of the quan-

tity of sugar produced by the amber sorghum; that the millets, the Egyptian rice corn, and probably broom corn also, which is largely cultivated in some portions of the West, yield quite as much as the Indian corn. Here is a great opportunity for a new and lucrative industry, and there is little danger of overdoing it.

The cultivation of the millets, and especially of the pearl millet and the Egyptian rice corn, already introduced into Kansas and some of the other States, both as a forage plant and for the production of sugar, and the increase in the crops of Alfalfa, Lucerne, Hungarian grass, and possibly some of the other forage grasses, is well worthy of attention. We shall have more to say on this subject in connection with stock-farming. The yield of forage from some of them is enormous.

The rearing of silk-worms is an industry which, if rightly managed, might be made very successful. It does not require a very large outlay, but will be best conducted by colonies, some of the members of which have been practically familiar with the business elsewhere.

There is necessary, in starting the business, a plantation of mulberry trees, but this need not be large at first, and the tree grows very rapidly. The white mulberry (*Morus alba*) is perhaps the best, though some prefer the black (*Morus nigra*) or the many-leaved (*Morus multicaulis*).* Other trees afford food for silk-worms, such as the Osage orange, regarded by many as equal to the mulberry, the ailantus, the weeping-willow (*Salix Babylonica*), the kilmarnock willow, some of the osiers, several species of oak, and the garden lettuce, but the silk is better from the mulberry than from most of the others, and if well managed, no more expensive. When the mulberry trees are large enough to furnish a good supply of leaves, the silk-worm eggs should be procured, and the purchaser should avoid any fancy varieties, of which there are many in the market, but should confine himself to those kinds which will produce the large, single crop sulphur yellow, lemon yellow, or white cocoons. These in the long run

* M. Boissiere thinks the Lpoa or Japanese mulberry (*Morus japonica*) better than any other, as fourteen and a half pounds of its leaves will make one pound of cocoons, while of the white mulberry, twenty pounds are required, and of the *morettia* new species fifteen pounds, and the rose mulberry seventeen pounds.

will pay best. Shelves, or layers of brush, separated by proper supports, should be provided for feeding the worms, and the feeding, if the number is considerable, will keep the children pretty busy night and day for from three to five weeks. When the worms are ready to begin to spin, the brush is better than shelves or frames. When the cocoons are finished a few of the best shaped and largest must be reserved for the production of eggs, and the rest "stifled;" *i. e.*, the chrysalides killed, either by subjecting them to the fumes of camphor, or some of the other hydro-carbons, or to steam heat, or baking them. It is not best for the families to reel the cocoons themselves; if there is a colony of silk-growers, some of them will probably be skilful reelers, and one filature or reeling establishment is enough for a hundred silk-growers. Machines recently invented make reeling on a large scale easier than it was, and if the silk-growers bring their cocoons at an average price to the filature, receiving their pay when the silk is reeled and sold, a moderate capital only will be required. Raw silk is not so bulky as to make its transportation very expensive, but if at a distance from market the silk may be doubled, twisted, and thrown, or brought into the condition of tram and organzine, without any great addition to the cost. The pierced cocoons, or those through which the chrysalis has escaped, as well as wild silk-worm cocoons, if there are any, and the floss or outside silk of the reeled cocoons, may also be utilized in such an establishment, being boiled for a long time in soap and water, cut up, carded and spun to form the spun silk, or Schappé. Eventually it may be desirable to establish a factory for the production of sewing silk, ribbons, handkerchiefs, fringes and trimmings, dress goods, satins, laces, or velvets. The last are not as yet produced in this country. Cocoons are too bulky to bear long transportation, and the only successful silk-culture must either be, that in which one filature with skilled reelers works up the cocoons from a hundred families of silk-growers, or one in which the silk-worm eggs are produced for the market in large quantities. There is an active demand for these at high prices, but even if the business was conducted with only this end in view, the pierced cocoons might be utilized with profit.

One advantage of the silk-culture is, that it occupies but a few weeks of the year, and most of the work can be performed by children, while other farm or manufacturing work can be prosecuted during the remainder of the year. M. Boissiere has established a cheese factory to employ his operatives the remainder of the year. Conducted as we have indicated, it can hardly fail to be profitable in connection with the cultivation of other crops. The silk-worm disease which has so largely reduced the silk product of Italy and France, is not likely to be introduced here, but the silk-grower should select localities not subject to frequent and violent storms, or to severe thunder-storms, or rapid and extreme changes of temperature during the time of feeding, as the worm is then very sensitive, and easily killed. M. E. V. Boissiere, the French silk-grower and manufacturer already mentioned, has started silk-growing and silk manufacture with a colony of French silk-growers on a small scale at Silkville, Williamsburg P. O., Franklin county, Kansas, and after a struggle of several years, has succeeded in producing raw silk equal in quality to the best French and Italian, and his worms, though originally from the eggs from the moths of diseased worms, have proved perfectly healthy. A considerable portion of the raw silk produced at Silkville is reeled by hand by the daughters of the silk-growers, who had become experts in reeling in France.

The cocoons from French silk-worms are much larger and more easily reeled than those from Chinese or Japanese worms, and M. Crozier, M. Boissiere's manager, says that in 1878 the raw silk produced there brought in the French market 130 francs the kilogram, or about \$10 a pound. At this price the raw silk affords a better profit than the production of silk-worm eggs for market, and is safer, as the price of the eggs varies so much, and the demand for them is liable to be below the supply. In 1877, France alone paid 1,691,400 francs = \$338,280 to this country for silk-worm eggs; but a part of these proving worthless, from bad management, there was a decided falling off in the demand in 1878 and 1879.

But the price of raw silk also fluctuates widely, ranging within the ten years 1868-1878, for the best Italian, from \$7.25 to

\$15; for the best Japanese (Maibash) from \$3.75 to \$9.12, and for the Chinese (Tsatlee III.) from \$4.25 to \$8 per pound. In 1878 the prices were still lower, averaging at the close of the year only about \$2.50 per pound, for all qualities, European and Asiatic. It has since advanced materially. To command the highest price, however, the raw silk must be reeled with the greatest care and skill, so as to make a uniform thread, and on this account it can never be done successfully by inexperienced hands, and is best done by machines with skilled reelers.

The great increase in the silk manufacture in this country will create a large and steady demand for raw silk, and if it can be produced at paying prices, by the methods we have indicated, or if silk-factories can be established in the Western States and Territories, which will combine reeling with the manufacture of silk, this will become a favorite industry among the enterprising farmers of the Great West.

Another wide field for enterprise is in the direction of the cultivation of a greater variety of *textile fibres*. Even flax and hemp, the most common of the textiles after cotton, have not had a fair chance in the West. With the facilities afforded by our unrivalled machinery for the breaking of flax and hemp, and the abundance of pure water for bleaching, Minnesota and Dakota ought to have many millions of acres in these two crops.

The great demand for paper stock should cover all the marsh lands of Missouri, Nebraska and Kansas with Esparto grass, tule, marsh-mallow or the cane-brake; while farther south the palmetto could be produced, on lands now considered worthless, for the same purpose. The vast amount of wheat-straw and wild hay of Minnesota, Dakota, Nebraska and Kansas might be converted into paper and straw-board, to much greater profit than is gained by using both as fuel for running threshing-machines and factories. The new invention, by which, by chemical saturation and powerful compression, straw-board can be made into an artificial wood almost as hard as iron, and fit for all the uses of the best ornamental woods, at hardly more than a tithe of their cost, ought to be worth millions of dollars to those States, and to California, where the straw is also burned.

But the production of textiles is not limited to these fibres. Ramie, one of the most delicate and beautiful of textiles, has been raised successfully in Texas and Arkansas. Jute is even more successfully cultivated throughout the entire region below forty-two degrees, and there is a steady and large demand for it. The various fibres known as Tampico, Honduras grass, Panama grass and Agave fibre, can all be raised easily and profitably in Texas, Arkansas, Arizona and New Mexico; while the over-abundant cacti of Texas and Arizona can be utilized for the production of strong and excellent fibres suited both for rope and bagging purposes and for paper stock. A species of cactus, which grows in immense jungles or "*chaparral*" in Southern California, has already been utilized for making mattresses, for which its beautiful white and easily-curled elastic fibre, fit it admirably.

The Germans have achieved a good degree of success in cultivating *the nettle*, both for its textile fibres and as a good and desirable fodder. They cultivate their native plant, the *Urtica dioica*, but the *Bœhmeria nivea*, a Chinese and Indian nettle, from which comes the *China grass*, or *Ramie*, is said to be better where the climate is not too cold. A Canadian species, *Urtica Canabina*, is also highly commended. The cultivation is very simple; the nettle will grow on the very poorest land (though, of course, larger and better on that which is richer); its fibres are finer and better than hemp, and fully equal to the best flax, and it will yield from 300 to 500 pounds of white, fine fibre to the acre, while it is more easily hackled than either flax or hemp. It is worth a trial. The fodder can be saved in cutting it for the fibre, and is much relished by cattle.

Since the discovery and large production of the aniline colors from coal and gas tar, there has been a decreasing demand for madder, cochineal and other vegetable and animal dyes, but there is yet a considerable call for them, if only for the extraction of their ultimate coloring principles. Yet the cultivation of madder is not more difficult than that of most root crops, and where it is grown on a large scale the extraction of its active principle, alizarine, will afford large profit.

The cochineal is composed of the dried bodies of insects which feed upon the cactus, and the most widely diffused species of it. Their entomological name is *Coccus cacti*, and beside the usefulness of the cactus in furnishing textile fibres, it can be utilized to any required extent, in Arizona and Western Texas, in rearing this valuable little insect.

Another new direction for farming industry is found in the cultivation of oil-producing plants. The olive will flourish and yield fruit in most of the region south of the 38th parallel. It endures drought well, and will mature its valuable fruit, even in Arizona and New Mexico; and both the fruit and oil will command a ready market. It is already cultivated to some extent in California and Texas, and its culture deserves to be greatly increased.

The extraction of oil, and the sale of the oil-cake from the cotton-seed, is an industry which is already becoming very extensive in Arkansas, Louisiana and Texas, and is a great boon to the cotton-planter, transforming, as it does, what was formerly a nuisance into a valuable product. But there are other plants and seeds which furnish equally valuable oils, and which may be cultivated with very little labor. We have already spoken of the culture of flax and hemp under the head of textiles: but the seeds of each are very valuable both in their natural condition, and crushed, or ground, and pressed, yielding the linseed and hemp oils, so valuable in the arts, and the oil-cake, in demand for fattening cattle, and increasing the quantity and quality of the milk of milch cows. Other oil-producing plants, which admit of easy cultivation and yield a liberal return, are the *Sunflower*, which yields from 275 to 300 pounds of oil per acre, and an excellent oil-cake, and has a deservedly high reputation for absorbing and rendering innocuous, marsh exhalations; the two species of colewort (the common and curled) which yield from 650 to 875 pounds of oil to the acre, and almost a ton of seed; the winter and summer rape, which furnishes also good fodder, while the seed is in demand aside from its use in furnishing oil; the Swedish turnip-seed, and the turnip cabbage-seed, both yielding a good manufacturing oil; the gold-of-pleasure and the white

poppy—all of these yield from 550 to 650 pounds of oil to the acre. The *Sesamum indicum*, which grows well in the region below the parallel of 39°, is one of the most valuable of oil-producing plants in the world. It yields about forty per cent. of oil, and is an annual of simple and easy cultivation. The black-seeded variety is the best. It is sown thinly in drills. The oil, for all medicinal and pharmaceutical purposes, is fully equal to the best olive-oil, and keeps for many years without becoming rancid. It is preferred in the East, for table purposes, to the best olive-oil, and from its freedom from smell, is much used for extracting the perfume of fragrant flowers. The expressed cake is mixed with honey and preserved citron as a conserve, and without admixture, furnishes a food for bees. It is already cultivated to some extent in the South.

The tar-weed (*Madia sativa*) is found abundantly on the Pacific Slope, where it is indigenous. Its seeds contain an oil which is used as a salad-oil, and for all purposes to which olive-oil is applicable. It is easily cultivated, and yields from 550 to 650 pounds of oil to the acre. It is used in Europe largely to mix with olive-oil.

But, after all, the most profitable of the oil-producing plants for cultivation, is the *ground nut*, or *pea-nut*, usually called goober in the Southwest. It will grow on light or gravelly soil, and with decent cultivation should yield from forty to sixty bushels to the acre, and has been known to yield from 120 to 125 bushels. The whole plant is valuable. The vine makes excellent forage or fodder, the tubers or nuts are much in demand, when baked or roasted, by children and some adults. The oil expressed from them is of excellent quality, fully equal to olive-oil, and for many purposes superior, as for illuminating and lubricating purposes. It does not readily become rancid, and is very sweet and delicate. The pea-nut is largely imported into France, and the oil expressed there, and sold as the best olive-oil. The oil is also produced largely in the East India Islands, and on the African coast, whence it is exported to be used in the manufacture of the finest soaps. The nuts are also ground up and mixed with cacao, for the manufacture of choco-

late, and in the production of chocolate for confectionery—the cacao is now generally omitted.

Taking all its uses into account, there is hardly a more surely profitable crop than pea-nuts, especially if enough engage in it to warrant the erection of an oil mill. The price of nuts per bushel has varied in the past from sixty cents to \$2.25; but they are not likely to fall below \$1.25 per bushel hereafter. The yield of oil is from forty to forty-five per cent. of their weight.

The *castor bean* yields a crop which always has a prompt, though not a very high market value. It grows readily and rapidly, and the gathering of the crop is easily accomplished. It has been raised to a considerable extent in Kansas, Nebraska, Texas, and perhaps some of the other States. The crop seems to have been carelessly cultivated or gathered, for, on soils like those where it was grown, the average crop should be at least twenty to twenty-five bushels to the acre, while in very few instances did it exceed fifteen bushels, and in the majority it was only ten or eleven. The price paid for the beans was about one dollar a bushel, a price which gives a very large profit to the mills which express the oil, inasmuch as the beans should yield forty-seven per cent. of oil.* With more care in cultivating the crop, and a sufficient number engaged in raising it in one neighborhood to sustain a co-operative mill in the vicinity, the crop might become a tolerably profitable one.

There are undoubtedly some districts of considerable extent in the Great West, where, under favorable circumstances, both tea and coffee might be successfully cultivated, the former especially, and yet we hesitate to commend it as a desirable industry, for several reasons; it requires a considerable investment, though not all in one year; there are no returns under six or seven years, and the tea gardens must be sufficiently extensive to warrant the establishment of a large factory with many employés to prepare the teas, while there are so many opportunities for investing capital, which will bring a quick return, that

* It is probable that the *Ricinus sanguinarius*, or the *Ricinus minor*, both French species of the castor bean, would yield more bushels to the acre, and more oil to the bushel, than the *Ricinus communis*, the species most generally cultivated here.

it is difficult to command it for such an enterprise. Furthermore it is uncertain whether the leaves can be cured in such a way as to enable them to compete successfully with the Assamese, Chinese, and Japanese teas; and even if they were superior to them in flavor and quality, whether the public taste, which always prefers foreign to home-made productions, would regard them with favor. The coffee plantations require a still longer period of waiting before obtaining the first crop, though there is less time and skill required in its preparation for the market, when it is brought to the bearing condition. Coffee is, however, essentially a tropical production, and though there is a possibility of success in its cultivation, in Southern California, Arizona, and Southern Texas, there is hardly sufficient certainty to warrant the outlay necessary to make it a product of any great commercial value.

There remain to be considered the fruit and nut-bearing trees and shrubs which admit of profitable cultivation. We have already spoken of the olive, valuable alike for its fruit, its oil and its beautiful wood. Its cultivation has been attempted on a small scale with a fair measure of success, in Texas and Southern California, and perhaps also in New Mexico. It was cultivated, though with no great care and probably not of the best varieties, at the Jesuit Missions, and though these trees from long neglect have grown wild, they would furnish stocks for grafting the newer varieties upon. It is probable that the olive might be profitably cultivated in all the region south of the 39th parallel, which is not too elevated. It is worth the trial, for though the numerous substitutes for olive-oil may to some extent reduce its value, yet the olive has too many good qualities ever to become an unprofitable tree. The orange and lemon, which have become so popular and profitable in Florida, are already cultivated to some extent in Louisiana, Texas and Southern California, and might be, if they are not, in Southern Arizona. It is probable that some of the varieties from China or Persia, if not the several native varieties, might be cultivated as far north as the 38th parallel, though most of them would be injured by the occasional severe frosts which, at rare intervals, extend almost to the Gulf

coast of Texas. One species, the *Citrus Japonica*, or Kum-quat, bears a small but excellent orange, and is perfectly hardy. The lemon is not as hardy as the orange, but its culture is even more profitable. The shaddock, or large bitter orange, and the Seville, or bitter orange of the south of Europe, are both more hardy than most of the sweet varieties, but their fruit is less profitable. The citron, from the thick peel or rind of which the preserved citron of commerce is prepared, is not, we believe, cultivated on this continent, and its culture is diminishing in Europe. When an orange-grove is not in danger of frost it becomes in time immensely profitable, but it yields very little (and it is better that it should not mature any) fruit till it is ten years old. From the tenth to the twentieth year it will yield every year a good and constantly increasing crop of fruit, and a still larger one each year, from the twentieth to the thirtieth year. In an ordinarily healthy growth, without forcing, it does not attain its full maturity till about its thirtieth year. We have not deemed it necessary, in the case of either the tea or the orange-culture, to go into details, in regard to the processes of cultivation, or the preparation of the products for the market. In the case of the tea, these are not well settled, and in that of the orange and lemon, different climates and different varieties require diverse treatment. Those who contemplate their culture will be, necessarily, persons having considerable capital at command, and they will do well to make a special study of the subject, before investing. For this purpose, there are numerous essays and treatises to be had, some of them giving the results of careful, protracted, and intelligent experience.

The *pomegranate* is already cultivated in California and Texas, as well as in the Gulf States east of the Mississippi. Its delicious fruit finds a ready market at good prices, and the imperfect fruit is in demand for the manufacture of citric acid. It is capable of successful cultivation in all the region south of the 39th parallel, except those portions which are too elevated or too dry for fruit-culture.

The cultivation of the fig is not new in California, Arizona, Texas, Arkansas, or Louisiana, but it is capable of great exten-

sion, and could be profitably grown, either for the fresh or dried fruit in Southern Kansas, Southern Colorado, New Mexico, Arizona (wherever irrigation is possible, or there is sufficient rainfall), and nearly the whole of California. There are few fruits which yield as good a return from a small expenditure of labor. The banana, plantain, pine apple, guava, and other tropical fruits, flourish in the southern counties of Texas and Southern California, though they are at rare intervals, even there, affected by frost. The papaw, our indigenous fruit of the banana family, is hardier and ripens regularly in all the region south of the 40th parallel. It is worth cultivating, and might be so improved as to be a rival of the plantain. The indigenous nut-bearing trees and shrubs, the hickory-nut, butter-nut, black walnut, chestnut, beech-nut, and hazel-nut, in the North; the piñon or edible nut of one of the species of pine in the region west of the Rocky Mountains, and the pecan nut, chinquepin, and filbert, which, though not indigenous, grows wild, in the South, are all capable of extensive propagation, though the chestnut only thrives on soils of a particular quality. The pecan is one of the best of our indigenous nuts, and grows on a shrub or bush of moderate height.

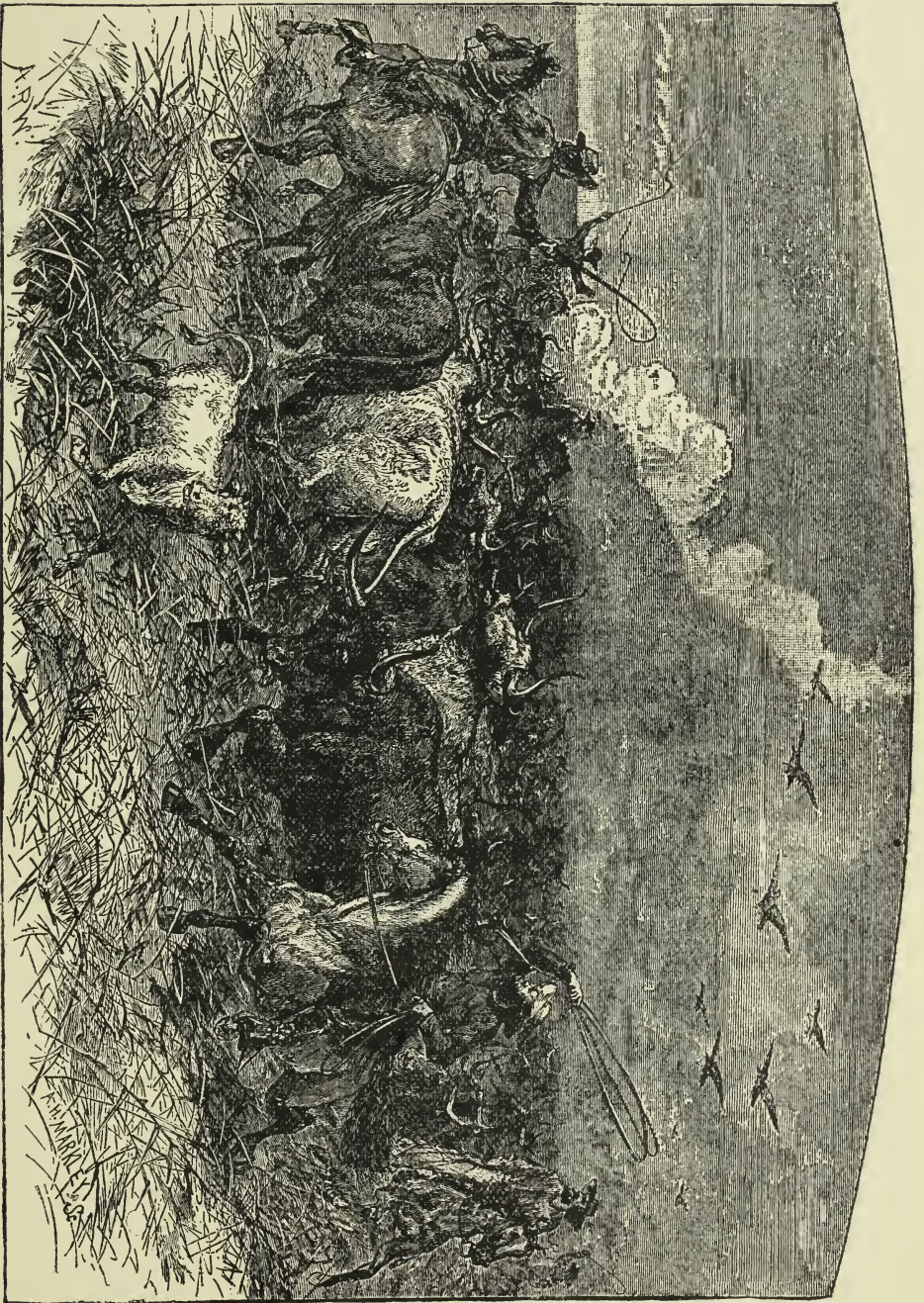
The foreign nuts which are already partially introduced, and which are likely to prove profitable in cultivation, are: 1. The English walnut, sometimes called also the Madeira nut, a fine, stately tree, which at twelve years of growth yields a large crop annually of the very fine nuts we know as English walnuts. 2. The Italian chestnut, whose large nuts yield a nutritious flour, and one which keeps well for two years or more. In Tuscany and Lucca, there are several millions of these trees, and the flour from the chestnuts furnishes the principal, and sometimes the entire farinaceous food of many thousands of the inhabitants. This, too, is a stately tree, and proves easy of culture here, while it may be readily grafted upon our native chestnut. It is admirably adapted to the western slopes of our mountains, and will thrive luxuriously there. 3. The almond, which being a congener of the peach, thrives wherever the peach can be successfully cultivated. The soft-shell almond is not as hardy as the hard-shell, and a sharp frost is fatal to either; but in Southern

California, Arizona, Southern New Mexico, and Texas, both can be, and are successfully cultivated. The pistachio nut is also on trial, and will probably prove successful. Of other fruit-bearing shrubs and trees, we may name the Japanese persimmon, lately introduced, and said to be an excellent fruit, much superior to our native species, which however has some good qualities; the carob, a legume-bearing tree, whose pods and beans are supposed to have been the husks fed to the swine, in the parable of the prodigal son; the jujube, whose pulp forms the material for the jujube paste of commerce, and the mezquite, indigenous in Texas, whose bark and root yield tannin in large quantities, whose pods furnish a nutritious food, and whose gum is almost identical with gum tragacanth.

Of trees and shrubs containing large amounts of tannin or tannic acid, besides the mezquite, there are five or six species of the rhus or sumac; four at least native, and containing from eight to twenty-five per cent. of tannin, and two foreign, the Venetian and the Sicilian sumac, which contain a little more. These are both cultivated here.* The wattle, an Australian tree of the acacia family, of which there are two species—the golden and the black wattle, *Acacia pycnantha* and *decurrrens*—is also a valuable tree for the tannin its bark produces. It attains its full growth in ten years, yields from twenty-four to thirty-six per cent. of tannin, and its wood is valuable for fences, for tools, and for fuel, being nearly or quite equal to hickory, for the last purpose. It grows in dry soils, and in almost rainless regions, and would be of great value for planting on the plains under the Timber-Culture Act.

All the species of *Spiræa* contain a large percentage of tannin. Some of these, as the *Spiræa tomentosa*, or common hardhack, and *Spiræa alba*, or white hardhack, are common weeds, and can be easily raised on the poorest lands, yielding three to five tons to the acre. The extract from this would be

* We are not aware that the bark of the ailantus has ever been tested for tannin, but as it belongs to the sumac family, it is reasonable to suppose that it may be somewhat rich in that principle. If it should prove to be, its rapid growth would make it nearly as valuable as the wattles of which mention is made above.



CATTLE DRIVERS ROUNDING A HERD.

superior to the best bark extract. The foreign species are of larger growth and are much cultivated as ornamental shrubs. It is doubtful whether they contain a larger proportion of tannin than the native species.

New forms of industry and profitable labor in connection with farming, are constantly brought to the attention of the public, some of them valuable, others valueless; but those which have been detailed in this chapter are sufficiently numerous to satisfy any ordinary ambition; they have all been tested, and none of them, like the cultivation of the opium poppy, which has been commended by some writers, are of a character which will injure rather than benefit mankind.

WE have already spoken of the vast extent of grazing lands found in this great Western Empire. What is the actual area of these lands can only be approximately estimated, since every year large districts, previously supposed to be only available for grazing and almost worthless even for that purpose, are found to be susceptible of cultivation, and to yield immense crops when subjected to culture. There are, furthermore, many tracts which have not yet been surveyed and are really unexplored even by the Indian, or the hunter and trapper; in some, and perhaps many, of these there are beautiful valleys, narrow, yet covered with a rich and succulent herbage, which will fatten and nourish large herds of cattle. As nearly as we can estimate, there must be somewhat more than a million of square miles of these grazing lands; enough to supply the whole world with beef, mutton, leather, and wool.

Most of the States and Territories have considerable tracts of grazing lands, but the stock-growing regions, *par excellence*, are Dakota, Montana, a part of Idaho, Eastern Washington, and Oregon, California, New Mexico, Colorado, Wyoming, Western Nebraska, Western Kansas, the Indian Territory, and Western Texas. Texas has at present larger herds of cattle than any other section, and exports live-stock and the carcasses of slaughtered beef in refrigerator steamers to Europe in large quantities; but the finest beeves sent to our Eastern markets and to Europe

are those from Colorado, Western Kansas and Nebraska, Montana, Dakota, and Wyoming. The native grasses of the Rocky Mountain parks and valleys are unrivalled for their nutritive qualities, and cattle fed on them will fatten with but very little grain. When the immigrants began to pour into the Pike's Peak region in great numbers, in 1858 and 1859, many of them lost everything except their cattle, and in their despair, finding these unable to draw their loads any further, they unyoked them and turned them out into the parks and grazing lands of that region to shift for themselves, believing that they would not be able to endure the fast approaching winter. The cattle went off, and for several months nothing was seen of them. The settlers at length started out to find their bones, but to their great surprise found them not only alive, but fat and sleek from the nutritious buffalo and gamma grasses, which, though cured by the sun, retained all their sweetness and nourishment.

In most of this Rocky Mountain region there is no winter shelter for cattle, and they hardly need any oftener than one winter in ten. A few of the more prudent stockmen put up rough, cheap sheds, and cut with a mowing-machine a score or two tons of the natural grasses, against a long or cold storm; but it is so seldom that these precautions are necessary, that their fellow-stockmen laugh at them for their carefulness. Even in Montana and Dakota the pasturage grounds are so seldom visited by severe or desolating storms, that provision for them is the exception and not the rule. In Oregon and Washington somewhat greater attention is paid to the sheltering of the stock, but in California no effort is made in that direction.

“WESTWARD the course of empire takes its way;
The four first acts already past,
A fifth shall close the drama with the day;
Time's noblest offspring is the last.”

So wrote Bishop Berkeley more than a hundred and fifty years ago, when this Great Western Empire, which we have

endeavored to describe, was utterly unknown to the civilized world, except from the reports of adventurous navigators who had touched upon its southern or western shores, or the journals of Jesuit missionaries, who had established themselves in California, New Mexico, and Texas, or the few hunters and trappers who had penetrated up the Missouri or its tributaries. The empire which he then saw in vision (for he had not at the time of the publication of this poem visited America) was composed of the colonies, which lay between the Appalachian range and the Atlantic. A population of not more than 1,200,000 was the nucleus of the future empire.

Yet in this mere handful of people scattered along the Atlantic coast from Maine to Georgia, lay the germ of the grandest empire this world has ever seen—an empire destined to realize in altogether another sense than the late British premier gave to it, when he quoted a few months ago, the dictum of the great Roman orator,—*Imperium et Libertas*. Here is, and is to be, *the empire* in its vastness of extent, its teeming population, its immensity of resources, its ripe and universal culture, and its moral power over the nations of the earth, and united with this *the liberty* which is the right and privilege of a great people—a liberty which is not license, but law; a government *of* the people, *for* the people, and *by* the people. And of this great empire, the portion largest in population, most abundant in resources, and foremost in all great enterprises is to be the region lying between the Mississippi river and the Western Sea. To-day, this region has more than eleven millions of inhabitants. In A. D. 1900 it will have fifty millions. In A. D. 1950 who shall say how many? The capacity of the country, in point of production, to sustain human life, has never yet been tested; but if, when our arable lands are not one-twentieth developed, and our grazing lands can feed twenty times the cattle and sheep now there, we are feeding fifty millions at home, and nearly twenty-five millions in Europe, what can we not do when our resources are tasked to their full extent?

But where shall we begin to speak of the future of this goodly heritage, with which God has endowed this Nation? We have

told you of its present varied but beneficent climate, with its western Gulf stream from the north, bringing mild and genial breezes to the Pacific shore; of its torrid heats, coming up from Mexico, to be tempered by the Arctic cold from the Valley of the Red river of the North. Is there to be an improvement in its climates? We fully believe so. The vast plains beaten almost to the solidity of stone by the hoofs of the buffalo for many hundred years, are being rapidly broken up by the plow, and warmth and moisture penetrate the soil. The rainfall is increasing, and these treeless plains are fast becoming clad with groves and islands of forest trees, which will turn what was once a desert into a fertile field. The *mesas* and *plateaux* beyond the Rocky Mountains, drained of their moisture by the deep cañons cut by the rivers, were once densely inhabited, and again, by the planting of forest trees, and the boring of drive and artesian wells, their capacity for cultivation, and for sustaining a large population, drawn thither by their mineral wealth, will be fully restored, and the region so long remarkable for its intense heat in summer will enjoy an equable temperature.

Are we to look for any improvement in the soil and its cultivation? There is every reason to expect it. The greater rainfall will render those lands arable, which have not hitherto been considered so; and irrigation, which is only yet in its infancy, will develop the best qualities of a soil, whose fertility is almost incredible. Deep plowing and careful seeding should largely increase the grain crops, and the use of forage grasses and cotton-seed cake give opportunity for much larger herds of cattle and sheep on smaller ranches, than the great herds now occupy. All these changes will come, for the spirit of enterprise and improvement is rife among these western citizens. It is difficult to predict to what points the tide of immigration will flow most strongly during the twenty or fifty years to come. The extraordinary efforts made by the railway companies, which have lands to sell, have had a great influence in directing it toward certain States and Territories. The railway companies of Minnesota, the Northern Pacific and its feeders, have made known to immigrants both in Europe and the United States, the great

advantages offered by the climate, soil, and manufacturing privileges of Minnesota, and especially the great fertility and productiveness of the Red River valley, and the lands adjacent in Dakota; while other railroad companies in Iowa and Southeastern Dakota have commended the farming lands of that section. The Chicago and Northwestern Railway, with its extensive connections, the Wabash, and the Chicago and Burlington, all of them connected with the Union and Central Pacific Railways, as well as the latter roads themselves, have rendered great service to Iowa, Nebraska, and Northern Kansas, and Colorado, as well as to the Territories beyond. So, too, the Atchison, Topeka and Santa Fé Railway has been so important a factor in the settlement of Southwestern Kansas, and Southern Colorado, that it is within the bounds of truth to say that it has hastened their development by more than twenty years. The roads extending from Missouri, through Arkansas and the Indian Territory into Texas, as well as the Texan roads themselves, have added three-fourths of a million of souls to the population of that State within the past ten years. On the Pacific Slope these agencies have not been so actively at work, but they are now fast developing at the Northwest in Oregon and Washington, and at the Southwest in Southern California, Arizona and New Mexico.

The wonderful development of the mines in Colorado, Montana, Utah, and the Black Hills, has contributed largely to the influx of population into those sections, within the past three or four years. There is every reason to suppose that the discoveries of the precious metals in these States and Territories are as yet only in their infancy, and that they will go on for years to come with increasing magnitude each year; while New Mexico, Arizona, Texas, Idaho, and Nevada, with its added facilities from its Sutro and other tunnels, and possibly Eastern Oregon and Washington, will fill up the measure of prosperity in this direction to overflowing.

It is vain to attempt to predict the quantities of gold and silver which will be produced in this region within the next fifty years: we only know that already the yield of silver has disturbed the pro-

portionate value of silver and gold, which had existed for the last five hundred years, when fifteen ounces of silver would purchase an ounce of gold. Now the ounce of gold is worth more than fifteen and a half ounces of silver, and with our vastly increased production it will soon require sixteen ounces to purchase an ounce of gold.

The prevalent opinion among the best mining geologists is that the western and some of the eastern slopes of the ranges composing the Rocky Mountain chain, and the spurs running east and west from it, are charged with lodes or veins of gold and silver-bearing ores; and there is every reason to believe that the eastern, and perhaps the western slope, of the Sierra Nevada, through its whole extent, is equally rich in these ores. They have been traced as far north as the line of British America, and, indeed, beyond it; they exist in Montana, Idaho, and Eastern Oregon, and Washington, in Nevada, Utah, and Wyoming, in Colorado, New Mexico, and Arizona (in the last three, perhaps, most abundantly of all), and in Western Texas. The valuable mines of California are mostly on the western slope of the Sierra Nevada, though a few are on the eastern slope of the Coast Range.

If this opinion of the geologists shall prove to be correct there is nothing to prevent the opening of three hundred thousand mines, all profitable, if well managed, and a yield of one thousand millions of gold and silver annually. Such a yield could not fail to produce two results: the further disturbance of the ratio between the values of gold and silver, since the production of silver will be far greater in bulk, and probably greater even in value, than that of gold; and a universal advance in the price of other commodities, or, which is the same thing, a depreciation of the purchasing power of gold.

But it is not solely in the so-called precious metals that the production will be so greatly increased; lead is combined with silver in certainly eighty per cent. of the ores; copper and zinc with both gold and silver in a very considerable proportion, and iron, platinum, osmium, and other rare metals in a small number. But all these metals, or rather their ores, are found in

great abundance without any admixture of the precious metals, and the ores of lead, copper, zinc, and iron are capable of immense development. Another decade will see copper ores reduced, and the copper refined, in the immediate neighborhood of the mines, in such quantities that there will be no necessity of importation of that metal, and still less of sending the concentrated ores to Swansea, or anywhere else, for reduction. Iron and steel will be made so abundantly and cheaply from the very best ores and by the best processes, that, instead of importing either to supply our greatly increased demand, we shall export both iron and steel to all the nations around us. Before the dawn of the twentieth century, tin will be the only metal we shall have occasion to import; and if, as seems probable, the small veins of tin already discovered in California, Nevada, Utah, Colorado, and Texas shall enlarge as they go deeper into the earth, this, too, may be stricken from the list of our imports. Platinum, nickel, aluminium, all destined to play an important part in our manufactures, in the near future, exist here, and can be produced as cheaply as anywhere else in the world.

All the metallic and mineral earths and elements used in medicine, chemistry, farming, or the useful arts, and all the salts of these, either exist as the natural productions of this region, or are capable of easy transformation into the compounds adapted to use.

Of other mineral products, coal exists in too large quantities, and of every known quality and variety, to make any lack of it possible for ages to come; whether required for the production of heat or steam, for manufacturing or for smelting, for coking coal for the production of iron and steel, or for family use, anthracite, semi-anthracite, bituminous, semi-bituminous and lignites, in all these forms, are to be had for the asking, at reasonable prices and at hundreds of points.

Petroleum, whose existence has long been known, but which has not been largely developed, is now found in such quantities in Wyoming and California as to have already become a large item in the traffic, and will eventually prove a formidable rival of the Eastern oil wells. If, before the close of the century, elec

tricity does not become the universal illuminator, the oil wells of Wyoming and California may be taxed to the utmost to supply the illuminating and heating material for this Western Empire.

An eminent metallurgist and scientist has recently estimated the entire mineral production of the region west of the Mississippi for the year 1880 as worth \$1,000,000,000, and has given the items on which his estimate is based.

Population.—The last Census gives the figure of 132,159, scarce one soul to each square mile of its rugged surface. It was but 40,000 in 1880, and only 20,000 ten years before. The whole vote in 1890 for Congress was 31,090.

PART II.

THE SEVERAL STATES AND TERRITORIES DESCRIBED.

CHAPTER I.

ARIZONA.

THE Territory of ARIZONA occupies a part of the southwestern portion of "Our Western Empire," though separated from the Pacific by Southern California and the rocky and terrible desert of Lower California, above the head of the gulf; it does not extend so far south as Southwestern Texas, but is comprised between the parallels of $31^{\circ} 20'$ and 37° of north latitude, and between the meridians of 109° and $114^{\circ} 35'$ west longitude from Greenwich. But a small portion of it has been surveyed, and as its western boundary along the Colorado of the West is irregular, there is some doubt about its actual area. It is estimated, in the last Land Office Report, at 113,020 square miles, or 72,906,240 acres. The probability is that it will be found to exceed this amount by several thousand square miles. Its form is somewhat irregular; on the north it is bounded by the Territory of Utah, the thirty-seventh parallel forming the boundary as far

west as the 114th meridian, which forms the western boundary of Utah; this meridian forms also the western boundary of Arizona as far south as the thirty-sixth parallel, where the Colorado of the West crosses the angle formed by the meridian and parallel, and proceeds northwest and then west-southwest, and turning sharply south at Callville, just after it emerges from the Grand Cañon, flows southwardly thence to the Gulf of California, forming, for all this distance (about 500 miles), the western boundary of Arizona. The original southern boundary, acquired from Mexico in the Treaty of Guadalupe-Hidalgo (February 2d, 1848), was the river Gila, the most considerable of the lower affluents of the Colorado, and the only one which is navigable for any considerable distance. By the Gadsden Treaty, made at Mexico, December 30th, 1853, all the territory lying south of the Gila to the border of the Mexican State of Sonora, was conveyed to the United States. The southern boundary now runs due west along the parallel of $31^{\circ} 20'$ to the 111th meridian, and thence west-northwest in a straight diagonal line till it reaches the Colorado in about $32^{\circ} 30'$. The Territory is bounded on the east by New Mexico.

The law authorizing the organization of the Territory was passed February 24th, 1863, and the Territorial Government inaugurated December 29th, 1863. It has never been thoroughly explored, and, up to 1880, only about 6,100,000 acres had been surveyed, about one-twelfth of its area. Its area is about equal to that of all the New England States, New York and New Jersey. The country is mountainous in much of its extent, though there is but little regularity about its mountain ranges. In the middle and northeast there are elevated plateaux of vast extent having a mean altitude, varying from 3,000 to 7,500 feet above the sea, and from these plateaux volcanic cones and hills rise at many points. In the north a mesa or plateau stretches away far into Utah Territory. South of the Gila river the plain sinks almost to the sea-level, but in the southeast and along the Sonora line, there are fourteen or fifteen detached ranges, and four or five isolated peaks. Many, perhaps most, of the mountain ranges have a general course from north-

west to southeast, but the Mogollon Mountains, and some of the other groups extending into New Mexico, have an east and west direction. The highest known elevation in the Territory is Mount San Francisco, at the northern end of the lofty San Francisco plateau, from which it rises to a height of 12,700 feet above the sea-level.

Scattered among these mountain ranges, detached and isolated mountain summits, plateaux and mesas, are many valleys of great beauty and fertility, but the river valleys are generally narrow ravines, gorges and cañons, accessible to the rays of the sun only at high noon, and whose precipitous and nearly perpendicular walls excite terror rather than pleasure. The valleys of the Colorado Chiquito, or Flax river, and of the Rio Salinas, or Salt river, are exceptions to this, being the garden spots and granaries of the Territory, and the bordering mountains furnishing great stock-ranges where the cattle are sometimes too fat to be driven.

The most remarkable feature of the topography of Arizona is the tendency of its rivers and streams to form cañons, of great depth and with precipitous sides. Either the strata through which these rivers have cut their way to the Gulf of California are more friable and easily eroded than the same strata elsewhere, or the great descent of the rivers and their immense volume when swollen by the rains and melting snows give them a force which is irresistible. The whole Territory is drained by the Colorado river and its tributaries. Most of these tributaries—all, indeed, except the Gila, which is in itself a large river—enter the Colorado high up in its course; the San Juan, which enters the northeast corner of the Territory and receives a considerable affluent, the Rio de Chelly, there; and the Colorado Chiquito, or Flax river, with its important affluents, the Rio Puerco of the West, Rio Quemado, and Chevelon's Fork, falling into the parent stream above the Big Cañon of the river; forming deep, dark and precipitous cañons of their own. The Colorado itself, through more than 600 miles of its course through Arizona, flows through deep cañons, and receives nearly 200 streams, large and small, all of them coming through gorges of

less depth, and falling over the as yet only partially eroded rocks in cataracts, into the main stream. Its descent in these 600 miles is more than 3,000 feet. The Big or Grand Cañon is one of the wonders of the world. Its descent has been several times attempted, and was accomplished, though not without loss of life, by a party under command of Major J. W. Powell in 1869, and again in 1871.

The narrative of these descents, as given by the intrepid explorers, is of the most thrilling interest. Through its whole course, except the last 500 or 600 miles, and through the entire course of its principal affluents, these cañons succeed one another, each one in the downward course of the current being deeper, darker and more terrible than its predecessor. At irregular intervals there are rapids, cataracts, and falls of great height, while every one of the tributary streams plunges into the main river through a minor cañon of its own, by a cataract often of 150, 200, or 300 feet. The ten stalwart men, provided with every necessity for their perilous journey, and stocked with ample supplies, who, on the 30th of May, 1869, had started from the Green river station, in four boats, to descend the Colorado, had passed through the last of the great cañons; on the 29th of August, their numbers reduced to six, their boats to two, hatless, shoeless, and ragged, their provisions exhausted, their instruments broken, and they themselves battered and bruised by their conflicts with rapids, cataracts, whirlpools and rugged rocks. The walls of their long prison house were in some places more than a mile in height, and in their dark gorges they could only catch a glimpse of the sun at high noon. Yet the monuments, towers, cathedrals, castles and lofty battlements of all conceivable colors, were grand, impressive and often beautiful beyond description; and worn and wearied as they were, they were full of enthusiasm over the accomplishment of their perilous voyage. Three of those who had left them were slain by Indians; one returned to Utah.

The river is navigable, though with some difficulty, on account of its numerous rapids, from Callville, Nevada, at the terminus of the Grand Cañon, to its mouth, a distance of 612 miles.

Neither the Colorado Chiquito nor the San Juan are navigable, but their cañons and the rapid descent of their waters are only inferior to those of the parent stream. The lower waters of the Colorado are not much higher than the Gulf of California, and, indeed, flow at one point through a broad and almost stagnant lake. The Gila rises in the mountains of New Mexico, and for about one-half of its course traverses a mountainous region, though it does not at any point cut for itself deep or precipitous gorges. From the mouth of the Rio San Pedro its course is through a less elevated region, and a part of the distance is navigable and without rapids.

These deep cañons of the principal rivers drain much of the surrounding country of its moisture, and render large tracts unfit for anything but grazing, and still larger ones unfit for that, unless by aqueducts, reservoirs, or artesian wells the necessary water can be supplied for stock. In the existing condition of the country, much of the rainfall which, in some seasons, is abundant, or sufficiently so for the country, if it could be saved, is wasted, running off from these hard-baked table-lands into the cañons and not penetrating the soil. Yet this soil under irrigation is wonderfully productive. The lands which can be irrigated yield sixty-five bushels of the finest wheat in the world to the acre, and proportionate quantities of other cereals; while Indian corn and the root crops are produced in almost incredible quantities. Fortunately for the Territory, very much of this land which once produced large crops can be reclaimed; many of the gorges and ravines can, at small expense, be made reservoirs, and thus treasure up the water which comes down from the melting snows of the mountains, or that which now runs off into the cañons after heavy rains, and this can be used with great advantage for irrigation, for the watering of live-stock, and for mining purposes; while deep plowing and the breaking up of the hard and dry sod will render the soil far more pervious and absorbent of the rains, and so capable of more easy cultivation. But on these *mesas* and high table-lands, where there are no streams available for purposes of irrigation, artesian wells have never failed to bring water, and usually with sufficient head and

in sufficient quantity to flow of itself without pumping and to supply pools or reservoirs of great extent.

In contradistinction to the Eastern States, where the streams maintain themselves in gathering strength from mountain to sea, dryness is one of the striking features of this whole elevated region. Streams and springs are few and far apart. The larger streams gather no affluents, but waste themselves in absorption and evaporation, and the smaller ones usually sink and disappear under the first valley which they enter, where the soil is generally light and loose enough to absorb them. But the water can there always be found; in the lower country, at variable depths of 50 to 250 feet, and usually only a few feet below the surface in many of the upland valleys. This may give the necessary provision of water for the farms in the valleys, while the mountains furnish it sufficiently for stock. There are two seasons of falling weather: the heavy summer rains, when the washes and stream-beds become temporary torrents, and the winter season of rains and snow. Now, at the end of October, the falling weather of the winter has not yet commenced, except in the high mountains. The days are warm, the sky is uninterruptedly cloudless, but ice makes at night, and a light snow has just fallen in the San Francisco Mountain. The grass there is beginning to dry up, and the northern face of the mountain is probably covered with snow.

The climate of Arizona may, perhaps, be inferred from what has already been said. It varies in different parts of the Territory. The lowlands, from Fort Yuma eastward, along the valley of the Gila and farther south between the thirty-second and thirty-third parallels, are extremely hot in summer. May, June, July, August, and September are the hottest months, and a record of 112° Fahrenheit in the shade is not very infrequent during those months. During the other months of the year the heat is not excessive, and the dry air makes it healthy. The rainfall is principally in July and August in this part of the Territory, though there is occasionally a season of rain in December and January.

The mineral wealth of Arizona is undoubtedly very great. Its veins and placers of gold, silver, copper and lead, and its carbonates and oxides of iron, platinum and quicksilver are distributed very widely over the Territory. Gold is found free both in placers and in quartz lodes ; silver in galena, and combined with both lead and copper as sulphides and carbonates ; copper is also found alone in the form of gray sulphurets ; quicksilver in the form of cinnabar and perhaps other combinations ; tin, platinum and nickel nearly pure ; iron ores of all kinds, and well situated for producing the finer qualities of iron and steel ; besides the anthracite coal in the northeast there is bituminous coal adapted to smelting purposes at Camp Apache and elsewhere. Immense deposits of salt of the purest quality have been discovered, and there are large beds of sulphur, gypsum, hydraulic lime, valuable mineral springs, natural loadstones of great magnetic power, and fossil woods of many varieties. There are also opal pebbles, garnets, red, white and yellow ; azurite, malachite, chalcedony, sapphires, opals, and possibly some diamonds.

Of the regions north of the Colorado and the Colorado Chiquito, there is hardly enough known to justify any considerable description of their vegetation. Near the Colorado the land is so thoroughly drained of moisture as to be almost a desert. East of the Colorado Chiquito is a broad plateau, a portion of which is volcanic in character, and is laid down upon the maps as a " painted desert," probably from the color of its limestones, shales, and sandstones. North of this are the villages of the Moquis, where, in the past, the water has been treasured up in reservoirs for domestic purposes and for irrigation. On portions of these mesas they were accustomed to cultivate their fields of blue, red, yellow, orange-colored and white corn, keeping each carefully in fields by itself, and garnering them in separate granaries.

All the wild animals of the western slope of the Rocky Mountains, and the eastern slope of the Sierra Nevada, should find homes in the forests and plains of Arizona. Perhaps occasional specimens of nearly all of them may be found but, as a matter of fact, wild animals are not very numerous in Arizona. Of the larger game the elk is rare, but there are two species of deer, the Rocky Mountain antelope, the bighorn or mountain sheep, and the Rocky Mountain goat

or goat antelope. Most of them were more abundant in the northern part of the Territory than in the southern. Of the smaller game, there are the sage hare, the jack rabbit, and several species of squirrels. Of the larger beasts of prey, the grizzly bear is very rare, if he inhabits the Territory at all; the black and cinnamon bears are more numerous. The puma or cougar is found in the forests, though less numerous than in better-watered countries; the jaguar is found in the low lands, though less abundant than in Texas. The ocelot, the wild cat and the lynx are occasionally found in the forests, as well as the red or gray wolf, and one or two species of fox. The prairie wolf, usually called the coyote,* is not found in the Territory, though the true coyote, a miserable little cur of an animal scarcely larger than a fox, is occasionally seen; but there are peccaries, raccoons, opossums, skunks, and the gopher or prairie dog or marmot. There are said to be large herds of mustangs or wild horses in the plains of Southern Arizona. Of birds there are a considerable number, many of them of gay-colored plumage. The Wheeler expedition sent to the Smithsonian Institution 500 specimens, and 183 distinct species, and others have since been discovered. Game-birds are abundant, pheasants, partridges, quails and grouse, especially the sage-hen and the prairie-hen. The crane, ibis and flamingo are among the birds of Southern Arizona. Eagles, vultures, buzzards, hawks and owls are numerous; the king vulture, little inferior in size to the condor or lammergeier, a rare bird in North America, is only found in the United States, in this Territory and in Texas. There are many varieties of fish found in the rivers, some of them edible fish of great delicacy and peculiar to this Territory. Several species of fish have been discovered in the mineral springs. There are also many species of mollusks. The reptiles and serpents of Arizona are formidable, and in some parts of the Territory numerous. There are alligators in the Gila and Lower Colorado, horned toads, lizards, scorpions, and centipedes in the chaparral and among the cacti, rattlesnakes on the *mesas* or table-lands of Central and Northern Arizona.

The skunk, in other sections a harmless animal, except for his fearfully offensive odor, is, in all the region below the fortieth par-

* Colonel Richard Irving Dodge, United States Army, a very high authority in all hunting matters, insists ("The Plains of the Great West") that the coyote is an insignificant little animal hardly larger than a fox, and is found only in Texas, Arizona and Mexico; and that the prairie wolf, so often called a coyote, and so abundant on the "plains," is really an entirely different and much larger species of the canine family.

allel, very much dreaded for his carnivorous propensity. Finding his way into a camp, or where settlers are sleeping on the ground under tents, he proceeds without any hesitation to bite and gnaw the face or hands or feet of the sleepers, and his appetite for human flesh and blood once aroused he will return to his repast even if driven away. These bites in very many cases produce hydrophobia, though the animal itself shows no signs of rabies. These animals are very numerous in Arizona, New Mexico, Colorado, Kansas, the Indian Territory and Texas, and though many thousands of them are killed every year for their skins, the fur being in great demand in the fashionable world, they do not seem to diminish in numbers. Colonel R. I. Dodge relates a case of these skunk bites, which, happily, did not prove fatal. It occurred in the Guadalupe Mountains in Texas, not far from the southeast border of Arizona. A soldier and his comrade were sleeping in a common or A tent. The soldier dreamed that he was being eaten up by some animal, but a sort of nightmare prevented his moving. After some time, however, the pain and horror together woke him up to find a skunk eating his hand. With a cry and sudden effort he threw the animal from him. It struck the other side of the tent and fell upon the other man, who, recognizing the intruder, rushed out of the tent. The bitten man, who had heard of the surely fatal result of skunk-bite, was so paralyzed with fear and horror that he made no effort to get up, and seeing the skunk coming towards him again buried himself in the blankets. The skunk walked all over him, apparently seeking for an opening, and finding none began to scratch the blankets as if trying to dig out his victim. The mental condition of this poor fellow can better be imagined than described. In the meantime the other man had loosened the tent pins and lifted up one side of the tent, letting in the moonlight; then pelting the animal with sticks, from a distance, at last frightened it so that it ran off into the deep, dark bank of the river. This skunk emitted no odor, and was undoubtedly simply hungry and not rabid. The man came to Colonel Dodge in the morning with his hand bound up, and asked if there was any cure for a skunk-bite. The colonel's heart sunk within him, but

he made light of the matter and examined the wound. The whole ball of the right thumb was torn, lacerated and gnawed in a fearful manner. He had no caustics or other means of cauterization, and so long a time had elapsed that he thought they would have done more harm mentally than good physically. So he had the wound carefully and thoroughly washed with Castile soap, cut off the protuberant pieces of mangled flesh, and, binding it up, kept on a simple water-dressing till the wound healed, which was in about ten days. The man was with Colonel Dodge for more than a year after this, but never experienced any ill effects except temporary pain from the wound. Colonel Dodge says that this was the only non-fatal case of which he knew in that region, though in other sections they were not often fatal.

The gray wolves not unfrequently suffer from rabies or go mad, and in that condition lose all fear, and will rush into houses, tents, etc., biting every one whom they can reach.

Productions of Arizona.—In 1879 there was about \$3,500,000 of gold, silver and copper sent to San Francisco from Arizona. In 1880, the amount will, in all probability, be over \$8,000,000, and as soon as railroads, now constructing, are completed through the Territory, the mineral exports will be much increased, and lead, anthracite coal, platinum, quicksilver and other metals will be added to them.

Wheat is the principal vegetable production exported. It is of excellent quality, fully equal to the best California, and where irrigation can be practised, the yield is enormous. We have no statistics of the vegetable crops gathered the last year, and believe none have been collected. Fruit, of semi-tropical qualities, is beginning to be extensively cultivated. Lumber and timber can be produced in some quarters, sufficient not only to supply the home demand, but to have considerable quantities to export. The Papago Indians, in the southwest, the Pimas and Maricopas, in the south and central region, the Mohaves, and to some extent, the Yumas, in the west and on the Lower Colorado, and the more civilized bands of the Apaches in the east, cultivate the soil and obtain a livelihood from it, the Maricopas and Papagos exporting considerable grain to San Francisco. In the northeast

the Navajos are largely engaged in sheep-farming, as already noticed. The Hualapais and the Yavapais, as well as some of the Apaches, are more inclined to a nomadic life, but will make good herdmen. The Apaches in the southeast, and the Pah-Utes or Pi-Utes, in the north and northwest, are not inclined to any industry, and are roving, troublesome and thievish.

The white population of Arizona is, according to the census just taken, almost 42,000 and rapidly increasing. In 1860 there were 6,482, and in 1870 there were 9,658. There has been within the past two years, a rapid influx of persons interested in mines and mining, as well as some who preferred agricultural pursuits, or the rearing of cattle and sheep. In 1870 there were 32,052 Indians in the Territory; the number has probably somewhat diminished since that time, as the small-pox and other fatal diseases have raged among them, and some of the tribes have scarcely escaped starvation, but they must number nearly 29,000 at the present time.

Besides the tribes we have named, there are other smaller bands, such as the Suechis, Apache Mohaves, Apache Coyoteros, Cosninas, Chemehuevis and Wallapis. The Apaches, who number about 5,000, and have a large reservation in the southeast, are divided into six bands: the Tontos, Pinals, Arivapas, Mes-caleros, Bonitos and Cochise's band. They are, for the most part, treacherous and mischievous, and have of late been raiding in New Mexico, but have met with summary punishment. With the exception of these and the Pi-Utes in the north, the Indians of Arizona are friendly to the whites, peaceable, and, for Indians, industrious.

There are, all over Arizona, ruins of ancient dwellings, castles and fortified villages, together with acequias or water-conduits, caves and dwellings hewn out of the rocks, or built up with large stones and evidently formerly containing a large population. Of these ruins, Hon. A. P. K. Safford, formerly Governor of the Territory, and its Commissioner at the Centennial Exposition, says:

"Many portions of the Territory are covered with ruins, which prove conclusively that it was once densely populated by a peo-

ple far in advance, in point of civilization, of most of the Indian tribes. There is no written record of them, and it is only a matter of conjecture who and what they were. Occasionally a deserted house is found sufficiently well preserved to ascertain the character of the architecture. The walls of the Casa Grande, situated on the Gila, near Sanford, are still two stories above the ground. In size, the structure is about thirty by sixty feet; the walls are thick, and made of mud, which was evidently confined and dried as it was built. It is divided into many small rooms, and the partitions are also made of mud. The floors were made by placing sticks close together and covering them with cement. Around and near the Casa Grande are the ruins of many other buildings; but, by the lapse of time, the decay of vegetation has formed earth and nearly covered them, and all that now marks the place where once a stately mansion stood is the elevation of the ground. Near the Ancha Mountains are ruins not so extensive, but in far better preservation than the Casa Grande, and near these ruins are old *arastras*, for the reduction of silver ores—which indicate that this old people were not unmindful of the root of all evil. On the Verde river are immense rooms dug in from the sides of high, perpendicular sandstone banks, that can only be reached with ladders.

“Very little information is obtained by excavating these ruins. Pottery of an excellent quality, and ornamented with paint, is found everywhere, and occasionally a stone axe is unearthed, but nothing to indicate that they were a warlike people; on the contrary, scarcely an implement of defence can be found, though there are reasons to believe, from the numerous lookouts or places for observation to be seen on the tops of hills and mountains, and the construction of their houses, that they had enemies, and that they were constantly on the alert to avoid surprise; and also, that by the hands of these enemies they perished. It is not improbable that the Apaches were the enemies who caused their destruction. Indeed, the Apaches have a legend that such is the case. During the past year I opened an old ruin at Puebla Viejo, on the Upper Gila, and found the bones of several human beings within; also the bones of a number of domestic animals.

On the fire, an *olla* (crockery-ware vessel) was found with the bones of a fowl in it, and it appeared as though the people within had resisted an attack from an enemy, and had finally been murdered. Shortly after, I visited a ruin in Chino valley, twenty miles north of Prescott, and over three hundred miles from Puebla Viejo, and there found that Mr. Banghart had opened a ruin on his farm. In it he found the bones of several human beings—five adults and some children—and the evidences were unmistakable that the inmates had died by violence, as the door and window had been walled up with stone, evidently to resist a hostile foe. The subject is an interesting one, and it is to be hoped that further excavations may throw more light upon the subject. The ruins of towns, farms and irrigating canals, that are to be seen on every hand through this vast Territory, give abundant proof that this country was once densely inhabited, and that the people who lived here maintained themselves by cultivating the soil. Probably that is about all we shall ever know of them. Many hieroglyphics are to be seen on rocks in different portions of the Territory, but by whom made, or what they mean, no one knows.

“In excavating a well between Tucson and the Gila, at the depth of one hundred and fifty feet, pottery and other articles, the same as are found in the vicinity of ruins, were taken out.”

But by far the most interesting of these ruins, inasmuch as they are not wholly ruins, but some of them inhabited by the remnant of the original tribes which built them, are those of the ancient province of Tusayan, in the northeastern part of the Territory. Seven of the sixty or more towns which constitute this once populous province, are still inhabited by the Moquis, who are undoubtedly the descendants of the original nation which once occupied the whole of this Territory, and who still adhere to the religion of their fathers. Of the sixty towns, thirty are still inhabited, but all except the seven are under the control of Catholic priests, and the Pagan rites and ceremonies are prohibited; but occasionally the inhabitants steal away from their villages and join with the Pagans of the “Province of Tusayan” in their rites and worship. There are other groups of these vil-

lages on the San Juan river in New Mexico and Southwestern Colorado, which have been visited by Professor J. S. Newberry and his companions, in 1860, whose language, religion, etc., are identical with these. Colonel J. W. Powell, United States army, visited the province of Tusayan in 1871, and spent about two months in studying the language, manners, customs, and religion of these interesting people. The narratives of Professor Newberry (which has not been published) and of Colonel Powell are both full of interest, and from them we glean a few particulars in addition to those already given in Part I., chapter vi., page 29, which will, we think, be of interest to our readers.

The villages of these Moquis are always situated on some lofty *mesa* or isolated table-land, difficult of access; their dwellings are of stone, usually three or four stories high, and around an interior court, common to the village. The outer walls are blank and inaccessible, and the inner court is only approached by a covered way easily defended. Entering the village plaza or interior court-yard, the houses are joined together, forming a continuous wall outside, and within the court they are built in terraces, the second story being set back upon the first, the third upon the second, and the fourth upon the third. There are no doors or low windows to the first story; access to it is had only by ascending a ladder to the top of the story and then descending another to the floor of the first. This lower story is for the most part a store-house where the corn or other grain used by the family is stored, each color of the corn by itself. The second story, or sometimes the third, contains the family room, which is twenty or twenty-four feet by twelve or fifteen in width, and about eight feet high. Usually all the rooms are plastered carefully, and sometimes they are painted with rude devices. For doors and windows there are openings only, except that sometimes small windows are glazed with thin sheets of selenite, the transparent flat crystals of gypsum. To go up to the third or fourth story you climb by a stairway made in the projecting wall of the partition. In a corner of each principal room a little fireplace is seen, large enough to hold about an armful of wood; a stone chimney is built in the corner, and often capped outside

with a pottery pipe. The exterior of the houses is very irregular and unsightly, and the streets and courts are filthy, though in the centre of each court is a large, deep fountain and pool, which is used for bathing; but within the houses great cleanliness is observed. Separated from the houses, indeed belonging to the village, is the kiva, called *Estufa*, "the Sweat House," by the Spaniards. It is a large underground room in the courtyard or plaza, chiefly intended for religious ceremonies, the church, in fact, of the village, but also used as a place of social resort. A deep pit is excavated in the shaly rock and covered with long logs, over which are placed long reeds, these, in turn, covered with earth, heaped in a mound above; a hole or hatchway is left, and the entrance to the kiva is by a ladder down this hatchway.

The people are very hospitable and quite ceremonious; they are also remarkably polite. Enter a house and you are invited to take a seat on a mat placed for you upon the floor, and some refreshment is offered, perhaps a melon with a little bread, perhaps peaches or apricots. After you have eaten, everything is carefully cleared away, and with a little broom made of feathers of birds,* the matron or her daughter removes any crumbs or seeds which may have been dropped. They are a very economical people; the desolate circumstances under which they live, the distance to the forests, and the scarcity of game, together with their fear of the neighboring Navajos and Apaches, which prevents them from making excursions to a distance, all combine to teach them the most rigid economy. Their wood is packed from a distant forest on the backs of mules or asses, and when a fire is kindled but a few small fragments are used, and when no longer needed the brands are extinguished, and the remaining pieces preserved for future use. Their corn is raised in fields near by, out in the drifting sands, by digging pits eighteen inches to two feet deep, in which the seeds are planted early in the spring, while the ground is yet moist. When it has ripened it is gathered, brought in from the fields in baskets carried by

* Some of these brushes or brooms are very beautiful, and are made of the feathers of humming-birds and other birds of gay plumage found in that region.

the women, and stored away in their rooms, being carefully corded. They take great pains to raise corn of different colors, and have the corn of each color stored in a separate room. This is ground to a fine flour in stone-mills, then made into a paste like a rather thick gruel. In every house there is a little oven made of a flat stone eighteen or twenty inches square, raised four or five inches from the floor, and beneath this a little fire is built. When the oven is hot and the dough mixed in a little vessel of pottery, the good woman plunges her hand in the mixture and rapidly smears the broad surface of the furnace rock with a thin coating of the paste. In a few moments the film of batter is baked; when taken up it looks like a sheet of paper. This she folds and places on a tray. Having made seven sheets of this paper bread from the batter of one color and placed them on the tray, she takes batter of another color, and, in this way, makes seven sheets of each of the several colors of corn-batter.

They have many curious ways of preparing their food, but perhaps the daintiest dish is "virgin hash." This is made by chewing morsels of meat and bread, rolling them in the mouth into little lumps about the size of a horse-chestnut, and then tying them up in bits of corn-husk. When a number of these are made, they are thrown into a pot and boiled like dumplings. The most curious thing of all is, that only certain persons are allowed to prepare these dumplings; the tongue and palate kneading must be done by a virgin. An old feud is sometimes avenged by pretending hospitality, and giving to the enemy dumplings made by a lewd woman.

In this warm and dry climate the people live principally out of doors or on the tops of their houses, and it is a merry sight to see a score or two of little naked children climbing up and down the stairways and ladders, and running about the tops of the houses engaged in some active sport.

In every house vessels of stone and pottery are found in great abundance. These Indian women have great skill in ceramic art, decorating their vessels with picture-writings in various colors, but chiefly black.

In the early history of this country, before the advent of the

Spaniards, these people raised cotton, and from it made their clothing; but between the years 1540 and 1600 they were supplied with sheep, and now the greater part of their clothing is made of wool, though all their priestly habiliments, their wedding and burying garments, are still made of cotton. The weaving is mostly done by the men, and their woollen blankets are remarkable for their density and their fine texture. They are perfectly water-proof, as we have already noticed, page 67.

Men wear moccasins, leggings, shirts and blankets; the women, moccasins with long tops, short petticoats dyed black, sometimes with a red border below, and a small blanket or shawl thrown over the body so as to pass over the right shoulder under the left arm. A long girdle of many bright colors is wound around the waist. The outer garment is also black. The women have beautiful, black, glossy hair, which is allowed to grow very long, and which they take great pains in dressing. Early in the morning, immediately after breakfast, if the weather is pleasant, the women all repair to the tops of the houses, taking with them little vases of water, and wash, comb and braid one another's hair. It is washed in a decoction of the soap plant, a species of yucca, and then allowed to dry in the open air. The married ladies have their hair braided and rolled in a knot at the back of the head, but the maidens have it parted along the middle line above, and each lock carefully braided or twisted, and rolled into a coil supported by little wooden pins, so as to cover each ear, giving them a very fantastic appearance.

The politeness of the people is shown in their salutations. If you meet them in the fields they greet you with a salutation signifying, "May the birds sing happy songs in your fields." If you do one of them a favor, even though a very slight one, he thanks you; if a man, he says "kwa kwa;" if a woman, "es-ka-li." It is an interesting feature in their language that many words are used exclusively by men, others by women. "Father," as spoken by a girl, is one word; spoken by a boy, it is another; and nothing is considered more vulgar among these people than for a man to use a woman's word, or a woman a man's.

At the dawn of day the governor of the town goes up to the



CLIFF DWELLERS.

top of his house and calls on the people to come forth. In a few minutes the upper story of the town is covered with men, women, and children. He harangues them briefly on the duties of the day; then, as the sun is about to rise, they all sit down, draw their blankets over their heads, and peer out through a little opening and watch for the sun. As the upper limb appears above the horizon every person murmurs a prayer, and continues until the whole disk is seen, when the prayer ends and the people turn to their various avocations. The young men gather in the court about the deep fountain, stripped naked, except that each one has a belt to which are attached bones, hoofs, horns, or metallic bells, which they have been able to procure from white men. These they lay aside for a moment, plunge into the water, step out, tie on their belts, and dart away on their morning races over the rocks, running as if for dear life. Then the old men collect the little boys, sometimes with little whips, and compel them to go through the same exercises. When the athletes return, each family gathers in the large room for breakfast. This over, the women ascend to the tops of the houses to dress their hair, and the men depart to the fields or woods, or gather in the kiva to chat or weave.

The theology of these people seems to be complicated. They acknowledge a Supreme or Great Spirit, the Creator of men, symbolized by the sun or by fire, but consider the planets, sun, moon, and stars the workmanship of a beneficent spirit of miraculous power and strength and most loving disposition, who dwelt among men and exerted his various powers to help them. This beneficent divinity, who bears strong analogies to the Hercules of the Greeks, the Divine Emperor of the Chinese, and the Hia-watha of the Northern Indians, they named Ma-chi-ta, and they never tire of telling of his loving tenderness to complaining and ungrateful humanity.

But they worshipped also the powers and forces of nature, at least to the extent of prayer and homage. The aridity of their soil made water, and especially rain, a prime necessity, and Colonel Powell gives us a prayer which he heard addressed, with a variety of other ceremonies, to Mu-ing-wa, the rain-god, by one

of the Moqui priests: "Mu-ing-wa! very good; thou dost love us, for thou didst bring us up from the lower world.* Thou didst teach our fathers, and their wisdom has descended to us. We eat no stolen bread. No stolen sheep are found in our flocks. Our young men ride not on the stolen ass. We beseech thee, Mu-ing-wa, that thou wouldst dip thy brush, made of the feathers of the birds of heaven, into the lakes of the skies and scatter water over the earth, even as I scatter water over the floor of this kiva; Mu-ing-wa, very good." After scattering white sand over the floor, the old priest prayed that during the coming season Mu-ing-wa would break the ice in the lakes of heaven, and grind it into ice-dust (snow), and scatter it over the land so that during the coming winter the ground might be prepared for the planting of another crop. Then, after another ceremony with kernels of corn, he prayed that the corn might be impregnated with the life of the water, and made to bring forth an abundant harvest. After a ceremony with certain jewels which seemed to be a part of the sacred emblems kept in the kiva, he prayed that the corn might ripen and each kernel become as hard as one of the jewels. This petition would seem to imply the desire that it might be preserved from the insect pests which do not attack the corn when it has become plenty. There seems to be in their theology no place for the sacrifice of animals, much less of human beings. All their sacrifices were of fruits, flowers, and seeds. The villages visited by Prof. Newberry in the San Juan region differed very little either in their religious worship, their habits and customs, or their language from these inhabitants of Tusayan. They cultivated only the *blue* corn, and their bread, made in the same way as that described by Colonel Powell, resembled nothing else so much as a ream of druggists' blue paper. Colonel Powell, after careful inquiry, estimated the inhabitants of these seven villages as about 2,700. The names of the villages are O-raibi, Shi-pau-i-luv-i, Mi-shong-i-ni-vi, Shong-a-pa-vi, Te-wa, Wol-pi, and Si-

* This declaration would seem to identify Mu-ing-wa, the rain-god, with Ma-chi-ta, their heroic deliverer and helper, for it was one of his special benefits conferred upon man that he brought him up from the lower world and raised for him the sky to its present altitude.

choam-a-vi. Prof. Newberry found a smaller number, perhaps not much more than 1,000, on the *mesas* of the San Juan region; but the ruins of their towns and villages, some of them of great size and strength and of remarkable architectural beauty, crown the summits of almost every *mesa* and hill-top throughout Nevada, Utah, Colorado, New Mexico, Arizona, and Southern California. "Not only Salt Lake City, but nearly every settlement in the Territory of Utah, and many in the State of Nevada," says Colonel Powell, "are built on the site of one of these ancient towns. They have been found also on the eastern slope of the Rocky Mountains, near Golden City, and southward from that point."

Who were these people, and from whence did they come? Colonel Powell, on somewhat insufficient evidence, thinks them related to the Shoshones, Utes, Pi-Utes, and Comanches, and regards the Navajos and Apaches, with some of the smaller tribes in California, as the intruders who have pursued them so mercilessly and nearly destroyed them from off the face of the earth. The arguments by which he supports this theory seem to us far from satisfactory. The erection of these massive buildings, the progress in agriculture, the entire avoidance of a nomadic life, the proficiency in ceramic art, the ability to spin and weave wool and cotton so dextrously, the daily preparation of skilfully cooked food, the worship of the sun, the virgin priestesses, and the complex system of religious belief, all indicate a superiority over the Utes, Shoshones, and Comanches which is entirely incompatible with any recent common origin with them; whatever may be the supposed affinities of language. It is no new thing for a conquered nation to force upon its conquerors its own language. The Saxons did this with the Normans; the Malays have done it with the Chinese. Their affinities of race, habits, and manners, as well as religion, seem to be much nearer to the Toltecs and Peruvians than even to the Aztecs, from whom they differ in language, and in the sternness and cruelty of their religious practices, while their difference from the Shoshones, Utes, and Comanches is infinitely greater. Colonel Powell says that some of the inhabitants of the thirty towns

which were destroyed have become nomadic, "for the Co-a-ni-nis and Wal-la-pais, who now live in the rocks and deep gorges of the San Francisco Plateau, claim that they once dwelt in pueblos or towns near where Zuni now stands." This is possible, though from what little is known of these tribes, the Pimas or Maricopas would seem to have had stronger claims to such an origin; but, if true, it is one of those cases of degeneration or moral lapse, which can only be accounted for on the Biblical ground of Adam's fall.

That these Moquis and their kinsmen, the ancient cliff-dwellers, were originally of Asiatic origin, and migrated from that portion of Asia inhabited by the Aryan race, is too evident to need demonstration; and those who are so zealous to find on this continent the descendants of the lost ten tribes, may find among them a more hopeful quest than among the Anglo-Saxons of Europe or America.

But mining is the pursuit in which Arizona, like the adjacent State of Nevada, is likely to be pre-eminent. Transportation for mining products is now good and will soon be better; capital is flowing into the Territory. The Indians have ceased to be troublesome in the mining districts, and wood and water, two indispensable requisites for successful mining, though not as abundant as desirable, are yet to be had and without excessive cost; while the placers, veins and lodes, already opened or now opening, indicate deposits of the precious metals, richer than those of any other State or Territory in the West.

CHAPTER II.

ARKANSAS.

ARKANSAS and Louisiana form the southeastern States of "Our Western Empire." Arkansas is washed by the waters of

the Mississippi along nearly all of its eastern boundary, separating it from Tennessee, except for the space of one county, where it has the St. Francis river for its eastern bound, and Missouri claims the little peninsula between the St. Francis and the Mississippi rivers. On the north, it is bounded by Missouri; on the south, by Louisiana, and on the west by Texas and the Indian Territory. It lies between the parallels of 33° and $36^{\circ} 30'$ north latitude, and between the meridians of $89^{\circ} 40'$ and $94^{\circ} 42'$ west longitude from Greenwich. Its area is 52,198 square miles or 33,406,720 acres, one-sixth larger than the State of New York, and about the same size as England without Wales.

Surface and Topography.—The eastern portion of the State, from 30 to 100 miles west of the Mississippi, is generally low, containing many lakes, bayous and swamps, and is, with the exception of some of the more elevated bluffs, subject to occasional inundation from the Mississippi river. These inundations, though sufficiently extensive to occasion much loss, seldom or never cover the whole of these lowlands, which rise gradually toward the foot-hills of the Ozark range.

The land rises by gradual stages from this low valley of the Mississippi, to the elevated plateaux of the central part of the State, as well as to the Black Hills in the north, and Ouachita Hills in the west. But the principal mountain range in the State is the Ozark, which, beginning in the southwest, trends northeastward and northward, spreading out into broad table-lands with narrow and deep ravines, and occasionally rising into higher summits, though of no great height. The general elevation of these table-lands is from 1,500 to 2,000 feet, and some of the rounded knobs may rise from 500 to 800 feet higher. The hills of this range have distinct local names, such as Pea Ridge and Boston Mountains (both famous during the late civil war), north of the Arkansas river, and Massime Mountains south of that river. The line of the St. Louis, Iron Mountain and Southern Railway, which crosses the State diagonally from northeast to southwest, nearly marks the line of division of the higher forest and mineral lands from the plain, prairie and lowlands in the east and southeast of the State. Large deposits of valuable

minerals are found in the northern division. The mountains, table-lands and valleys of this division present generally a rich surface, good drainage, romantic and picturesque scenery, and a productiveness remarkable for the formations and latitude. The southern, southeastern and eastern divisions have rich tertiary, post-tertiary and alluvial deposits which are not excelled in fertility by any land on the globe. Exempt alike from the intense heat of the extreme south, and the severe cold of the north, the genial climate and fertile soil of the State yield in abundance the rich productions of both regions. The rich bottom-lands will produce, under favorable conditions, from fifty to sixty bushels of Indian corn, and about 450 pounds of cotton per acre, which is considered a fair average crop. With better and more careful culture, they are capable of greatly exceeding this average, and in some instances do exceed it.

Rivers.—Arkansas is abundantly supplied with navigable rivers, so distributed as to give access interiorly to all parts of the State. The great boundary on the east is formed by the mighty Mississippi. The St. Francis on the northeast, which rises in southeastern Missouri and flows through the low, undulating portions of the northeast, where it intermingles with lakes, creeks and paludal surfaces, is a tributary of the Mississippi. It is navigable to and beyond the Missouri line.

The White river rises in northwestern Arkansas, flows through the lower southwestern counties of Missouri, and returns to the State, joining its affluent, the Black river, which affords, from the confluence, almost at all seasons, navigation for a distance of 350 miles. White river, with its tributaries, gives drainage for a broad expanse of country from the northwestern, middle and northeastern parts of the northern section of the State.

The Arkansas river, one of the largest tributaries of the Mississippi, rises in the mountains of Colorado, and flows easterly for a distance of 2,000 miles to join the Mississippi. White river is an affluent, flowing into it near its mouth. The Arkansas river bisects and drains this vast country; it is navigable entirely across the State, and, during high water, beyond it, far up into the Indian Territory. The Ouachita, with its tributaries, drains

almost the entire State lying south of the Arkansas river, or all that surface lying between it and the Red river. It is navigable 250 miles. The Red river is the southwestern channel of drainage, and is navigable throughout its course in the State, a distance of about 100 miles.

Black river rises in Southeastern Missouri and crosses five counties, discharging its waters into the White river. It is navigable from its mouth to the Missouri line.

Saline river rises in Saline county, and, after passing through six counties, discharges into the Ouachita in Union county. It is navigable for 100 miles.

Bayou Bartholomew, another tributary of the Ouachita, is navigable in the State for about 150 miles.

The Little river, an affluent of the Red river, and the Little Red river, an affluent of the White river, are both navigable for from fifty to seventy-five miles for six months of the year.

The Petit Jean, a tributary of the Arkansas, is navigable for about seventy-five miles.

Several smaller streams, such as the Caché, Dorcheat, L'Aiguille and Antoine, are navigable a part of the year.

Nearly every county in the State is traversed by one or more of these navigable streams, which, with their branches, form a navigable highway within the State of more than 3,000 miles, and secure an abundant supply of water to every county.

Most of these streams have their sources in springs in the hills or mountains, and furnish abundant and permanent water power for manufacturing purposes. Of one of these springs, the fountain-head of Spring river, a clear, limpid stream which flows through Fulton, Sharp and Randolph counties, emptying into Black river, Professor D. D. Owen, in his *Geological Reconnaissance of Arkansas*, thus speaks:

“The country is well watered, and possesses many fine water-powers—even at the very fountain-head of some of its numerous limpid calcareous streams, which frequently burst forth from among the ledges of rock. One of the most remarkable of these forms the fountain-head of the main fork of Spring river, known as the ‘Mammoth Spring,’ in Fulton county, welling up on the

south side of a low, rocky ridge, from a submerged abyss beneath of sixty-four feet, and constituting, at its very source, a respectable lake of about one-sixteenth of a mile from north to south, and one-fifth to one-sixth of that distance from east to west.

"It is said by those who have sounded the bottom, that there are large cavities and crevices in the rock, and that the main body of the water issues from a large cavernous opening, of some forty yards in circumference. It has been estimated that it boils up at the rate of about 8,000 barrels per minute; the correctness of this estimate we had no means of verifying, but it may be safely estimated that the average constant flow would be at least sufficient to propel from twelve to fifteen run of stones.

"The uniform temperature (60° Fahrenheit) and composition of the water is peculiarly congenial to the growth of a variety of cryptogamic, aquatic plants, possessing highly nutritive qualities, both for herbivorous animals and birds.

"In the early settlement of the country, herds of herbivorous wild animals travelled from great distances to this fountain for both food and water, as well as flocks of wild fowl. Now the cattle of the neighboring farms may be seen wading in its waters up to their middle, and browsing on the herbage, which appears peculiarly congenial to their tastes; it is, also, a general resort of geese, ducks and other aquatic birds. It affords valuable water-power for general manufacturing purposes."

In addition to her water-courses, Arkansas is reasonably well supplied with railways, which are being extended so as to embrace every section of the State.

The St. Louis, Iron Mountain and Southern road runs diagonally across the State, a distance of 300 miles, making connections with roads east and west. This is a land-grant road, holding nearly a million and a quarter acres of choice lands in this State which it offers to immigrants at very low rates, and by its enterprise has attracted many immigrants to the State. As a general rule an immigrant, in this State particularly, will do better to buy of the State or United States government, the lands he needs; but if, for any cause, he prefers to buy of a rail-

road company, he will find the St. Louis, Iron Mountain and Southern Railway will treat him fairly and honorably, as will the other land-grant railways also.

The Memphis and Little Rock road extends from the capital to Memphis.

The Little Rock and Fort Smith road is running a distance of 168 miles, up the valley of Arkansas, to the Indian border.

The Little Rock, Pine Bluff and New Orleans road is completed and running a distance of eighty miles, from Pine Bluff to Arkansas City, on the Mississippi river. A survey has recently been made of the gap between this city and Pine Bluff, which will soon be built.

The Mississippi, Ouachita and Red River road is completed, a distance of about thirty miles west from Chicot.

The Arkansas Central (narrow-gauge) is completed a distance of about sixty miles, and runs trains regularly between Clarendon on White river, and Helena on the Mississippi.

A narrow-gauge road is in operation between Malvern, a point on the St. Louis, Iron Mountain and Southern Railway, and the famous Hot Springs, thus giving the outside world a continuous line of railway to the Springs.

Climate and Rainfall.—The climate of Arkansas, except in the lowlands near the Mississippi, is better entitled to be called temperate than perhaps any other in the United States. The streams are not closed by ice in the winter, nor is the earth parched by drought in summer. The two points most characteristic of the climate of the State are Little Rock, the capital, for the moderately elevated table-lands, and Hopefield, opposite Memphis, Tennessee, for the lowlands. In Little Rock the mean annual temperature for a series of years is 62°.66 Fahrenheit; the highest point, generally reached in August or September, and for not more than one or two days, 96°; the lowest, generally reached in December, or more rarely in January, 4°; the annual range, 92°. The average rainfall is from fifty-five to sixty inches annually. In the more mountainous region in the northern and northwestern part of the State the mean annual temperature is about 60° Fahrenheit, and the rainfall a trifle less than at Little Rock.

At Hopefield the heat of the hot months is longer continued, though but little higher.

The average maximum temperature, which is reached perhaps on twelve or fifteen days of the summer, is 98° Fahrenheit. In exceptionally hot summers it may rise to $101^{\circ}.5$, but not for more than one or two days. The mean of the summer months is $81^{\circ}.4$. The average minimum is 9° , rising some years to 17° , and at others sinking to 2° . The mean temperature of the year is $60^{\circ}.6$. The average rainfall 63.42 inches.

Hon. John R. Eakin, Chancellor of the Pulaski Chancery Court, an eminent agriculturist and author of a treatise on viticulture, speaking in that work of a peculiarity in the climate of Central Arkansas, says:

"In the Eastern and Northwestern States, they all try to avoid a northern exposure. Our country is somewhat differently situated, especially that portion lying west of the Ouachita and between the mountain ranges south of the Arkansas. It may be well to dwell on this a little. This section of country, and also that north of the Arkansas river for a considerable distance, is the only part of the United States protected against violent winds. The mountains which shield it range east and west. The Blue Ridge, Allegheny, and Cumberland Mountains run in a north and south direction, and, except in sheltered nooks protected by spurs, the winds rush down on each side of them from Labrador and Hudson's Bay. The same is the case with the northern portion of Missouri, with Ohio, Illinois, and Indiana, and on down the Mississippi and the Southern States east of the river. These north winds are very sudden and destructive, bringing, in twenty-four hours, the climate of the frigid zone—throwing against vegetation the identical air that was but yesterday on an iceberg. This influence is greatly modified with us. These hills, to our north, perform the same office which the Alps do to Italy. This, as to climate, is the Italy of the United States."

Sudden changes in the climate are less frequent than in the Eastern and Western States. All evidence demonstrates that there is not, on this continent, any locality superior to this region

for the equable character of its climate and its freedom from sudden changes and violent winds.

In this connection it should be said that Arkansas, and especially this central region, has a deservedly high reputation for the relief of pulmonary diseases. It strongly resembles that of Mentone and Pau in the south of France. The tables of vital statistics of the census fully showed that no part of the United States was so favorable for consumptives as this, and partly no doubt for the reason which Chancellor Eakin has stated. The air, though mild and not subject to sudden changes, is not sufficiently hot to be relaxing, and respiration is not so difficult as in the thinner air of the elevated plateaux of Colorado and New Mexico. The difference may be stated in another way: the invalid who goes to Colorado may recover his health partly or wholly, but he must stay there. If he attempts to return East after one or two years the disease returns and speedily proves fatal. In Arkansas, on the contrary, the process of cure is radical, and the invalid, after one or two years, may return to the East without fear of the recurrence of the disease.

Minerals and Mineral and Hot Springs.—Arkansas has a great variety of mineral deposits, most of them of excellent quality and apparently of unlimited abundance. First in economic importance are its immense beds of coal. The Arkansas coal-fields have an estimated area of 12,000 square miles, wholly, so far as known at present, in the valley of the Arkansas river, though the carboniferous basin may prove to extend southward beyond that valley. The Arkansas river runs for more than 150 miles through this coal formation. The counties of Washington, Crawford, Sebastian, Franklin, Scott, Logan, Johnson, Yell, Pope, Perry, Conway, White, and Pulaski, are almost entirely situated in this coal basin. The veins vary from one to nine feet in thickness, though most of those which have been worked are from four to nine feet thick. It is found at from six to fifty feet below the surface. The coal is similar in structure and appearance to the Cumberland coal of Maryland, and analysis, as well as use, demonstrates its practical identity in quality with that well-known coal. It proves to be an excellent steam-

producing and manufacturing coal, and commands a high price for both purposes. Mines have been opened and are now in successful operation near Russellville and Ouita in Pope county, at Spadia, and at Horsehead, in Johnson county, and at several points in Sebastian and other counties. The coal has been used freely in Little Rock, St. Louis, Memphis, and New Orleans, and wherever tested it sells readily at a higher price than any other coal in the market. Inexhaustible deposits of hæmatite and other iron ores are found in close proximity to these coal-beds, and limestone of the best kinds for fluxing purposes and heavy forests of hard wood for charcoal are close by. Large and never-failing water-powers are contiguous to these coal and iron deposits. In the present demand for iron and steel, Arkansas offers extraordinary facilities for its successful manufacture.

Several zinc mines have been opened in the northern part of the State, principally in Lawrence and Sharp counties—which are as rich in every respect as any in the Union. Lead and silver are abundant, and several mines are now being profitably worked. Notable among these are the Kellogg mine, eleven miles north of Little Rock, two mines in Sevier, one in Montgomery, another in Boone, and perhaps others. These mines are sufficiently rich in silver (argentiferous galena ores, yielding about fifty ounces of silver to the ton) to leave the lead as a clear profit, after paying all expenses of mining, smelting, etc.

There are extensive caves of nitre and nitrous earth in Newton and other northern counties of the State, from which large quantities of powder were manufactured and used by the Confederates during the recent war.

There are also numerous salt springs—some of which are being profitably worked, notably one near Arkadelphia, which supplied salt for the entire army of Arkansas during its occupation by the Confederates in 1862-3.

Valuable mines of copper have been discovered in Montgomery and other counties, though no efforts have been made to work them.

The manganese deposits are of considerable extent and richness.

The novaculite or whetstone quarries near Hot Springs furnish a rock which has gained almost a world-wide fame, and its supply is inexhaustible.

Marble of superior quality and in exhaustless quantities has been discovered in Boone and Newton counties, a block of which has been placed in the Washington Monument.

Gypsum, kaolin, slate, limestone, granite, marl, chrome and other minerals for use as mineral paints, are among the economic minerals found in large quantities in the State, but few of them are as yet mined or quarried to any great extent.

Dr. Lawrence, of Hot Springs, contributed to the Centennial Exposition a collection of minerals, mostly from Magnet Cave, Hot Springs county, among which were manganite, or black oxide of manganese; melanite, or crystallized black garnets; green, yellow and black mica; crystallized schorlamites; quartz crystallized; crystals of Perovskite, hornblende, elæolite, epidote, strontianite, Shepardite, Lydian stone or touchstone, agate, hydro-titanite, titanite, iron, sulphur from iron pyrites, talc, rutite, isolated and in quartz; rose, smoky and milky quartz, chert, burrstone; the hornblendes, novaculite, quartzite, syenite and granite.

The Hot Springs of Arkansas are situated in Hot Springs county, about sixty miles southwest from Little Rock. A narrow gauge railroad, twenty-five miles in length, now conveys passengers directly to the springs from Malvern Junction, on the St. Louis, Iron Mountain and Southern Railway. The springs, now sixty-six in number, are in a wild, mountainous region, issuing from the western slope of a spur of the Ozark range, at an elevation of about 1,400 feet above the sea-level, and range in temperature from 93° to 150° Fahr. They discharge over 500,000 gallons of water daily, sufficient in quantity to accommodate, with delightful bathing, 10,000 bathers every day in the year. These natural earth-heated waters hold in solution valuable mineral constituents. Clear, tasteless, inodorous, they pour forth from the novaculite ridge as pure and sparkling as the pellucid Neva. The various springs are qualitatively allied, not holding in solution or freighted with too many mineral constituents, and they are free from all noxious gases. It is believed that the proper-

ties of the waters, especially in the treatment of chronic diseases, and particularly chronic rheumatism, scrofula, etc., are unequalled. There are no springs known of superior value, or that can compare with the Hot Springs of Arkansas, as adjuncts in the treatment of that class of chronic diseases. The advantages of the climate throughout the entire year, the pure, rarefied mountain air, the delightful waters, all make these springs one of the most delightful resorts for invalids in the United States.

Within from seven to twelve miles of Hot Springs are other springs, sulphurous and chalybeate, but not hot, to which many of the physicians order their patients after two or three courses of the Hot Springs treatment, and the change greatly facilitates their recovery. The Hot Springs waters are not only used for bathing and for hot vapor baths, but the water is drank in large quantities, as hot as it can be borne, and with great benefit. There are about 6,000 inhabitants in Hot Springs City, and it is said that 10,000 or more invalids annually avail themselves of its baths and healing medicinal waters.

Numerous analyses of the waters, which vary but slightly in their contents, though materially in their temperature, show that among the solid constituents of a gallon of the water are found the following:

Silicates with base,	Alumina with Oxide of Iron,
Bicarbonate of Lime,	Oxide of Manganese,
Bicarbonate of Magnesia,	Sulphate of Lime,?
Carbonate of Soda,	*Arsenate of Lime,?
Carbonate of Potassa,	*Arsenate of Iron,?
Carbonate of Lithia,	*Bromine,
Sulphate of Magnesia,	Iodine, a trace,
Chloride of Magnesia,	Organic matter, a trace.

The city of Hot Springs is in a deep ravine, and the springs issue from the slopes of the mountains on either side—those on one side being of much higher temperature than those on the other. The city consists of one very long and not very

* These salts and elements were in very minute quantity in any of the waters, and were not found at all in some of those examined.

wide street, with short streets running up the hills on either side. It has almost as many hotels, boarding-houses, hospitals and private dwellings, and quite as many physicians of all sorts, as there are patients. The hills in the vicinity are occupied very largely by small farmers of the class known in the South as "poor whites," who cultivate a little corn, a few potatoes, and keep a few swine, and a considerable number of fowls, and who in their indolent and rude way, succeed in eking out a bare subsistence. The whole region containing the springs has long been in litigation, and within one or two years has been decided to be the property of the United States. Provision has been made, in a rough way, to extend the benefits of the springs to the very poor without compensation, and many of these are now availing themselves of this privilege.

Vegetation.—The area of woodland in Arkansas in 1877, was 16,815,037 acres, just about one-half of its entire surface. The rapid progress of railroads in the State and adjacent States and the demands for shipment, lumber and manufactures may have slightly decreased this amount within the past three years, but Arkansas still possesses a larger proportion of timber lands than any other State or Territory of "Our Western Empire." And a very large proportion of her timber is of the very best quality, much of it the best of the hard woods, and pines of gigantic growth. At the Centennial Exposition in Philadelphia, fifty species of forest trees were exhibited (and these did not nearly exhaust the entire number found in her forests); these included thirteen species of oak, varying in diameter from twenty-one to fifty inches; two species of pine, thirty-six inches through; black walnuts, forty-two inches in diameter; hickory of three species, thirty-five to thirty-nine inches through; a cottonwood, eighty-four inches, and sycamores, sixty inches; red elm, sixty-three inches; maple, two species, the sugar and the curled, twenty-six inches; three species of gum trees, the tupelo, black and sweet gum, from twenty-nine to thirty-nine inches in diameter; cypress, forty-eight inches; yellow poplar, forty-five inches; American elm, forty-six inches; white ash, forty-two inches; Bois d'Arc (Osage orange), twenty-two inches; blue ash, twenty-three inches;

red cedar or juniper, sixteen inches; beech, thirty inches; persimmon, twenty-four inches; sassafras, twenty-eight inches; honey locust, twenty inches, and wild cherry, nineteen inches. The supply of pine, cypress and oak is almost inexhaustible. The pines south of the Arkansas river grow to the height of 150 feet and more, and are from six to seven feet through.

At the same exposition thirty-five species of pasture grasses, many of them new and native to Arkansas, were exhibited, all of them yielding largely and much sought after by cattle. The Alfalfa and four kinds of millet were also exhibited, yielding from four to eight tons of dried forage to the acre.

All the fruits are sure of luxuriant growth, including as well the different kinds grown in the Northern States as those which nearly approach the tropics. Apples, peaches,* pears, plums, quinces, cherries, apricots, figs,† grapes, strawberries, and other small fruits, grow luxuriantly in all parts of the State, and are noted for their size and flavor. In this climate fruit trees and the vine produce abundantly, and ripen their fruit in the greatest perfection; and, though it may seem incredible to northern fruit-growers, yet we are credibly assured that the fruit crop of Arkansas has not been a failure but once in thirty years.

Chancellor Eakin, in his little work on the culture of the grape, says:

"This is the best region for wild grapes in America. What we mean to assert is, that the region between the Mississippi and the Staked Plains, and between the Missouri river and the swamp lands of the Gulf, produce more and larger and better wild grapes than any other portion of the known world. This is deliberately said, after much reading, inquiry, travel and extensive observation."

The growing of grapes for wine is largely practised in the State, as well as the culture of the other small fruits for northern

* The apples of Washington and Benton counties, and of the southwestern counties generally, are noted for their fine flavor and are in demand in St. Louis and Memphis. The peach seems specially at home in this State. The fruit is large and of excellent flavor, and grows with very little care. Peaches here ripen full four weeks earlier than in the vicinity of St. Louis.

† Figs grow as finely here as in Louisiana, and nothing better can be said of that delicious fruit.

markets. All kinds of fruit and vegetables mature and are ready for market from three to four weeks earlier than in the latitude of St. Louis; and hence the culture of small fruits, and of market garden vegetables, is as profitable a business as a settler can prosecute, the transportation by river or railroad being speedy and cheap.

Wild Animals.—Of beasts of prey, there are some black and brown bears, though a much smaller number than its extensive forests would justify, rarely cougars and other wild felines. The jaguar may sometimes stray up from his Texan haunts, but we cannot learn of any hunters who have discovered him on the soil of Arkansas. There are also occasionally wolves, foxes, raccoons, opossums, and perhaps the Texan coyotes. Peccaries and wild hogs are sometimes found. The buffalo prefers the plains, and the wooded mountainous regions of Western Arkansas have no charms for him, but there are deer of two species; rarely the elk, but not except by accident the antelope or the bighorn. Rabbits or hares, squirrels of several species and the gopher, are the principal rodents.

Birds of prey are moderately abundant, but mostly of the eagle and vulture and hawk tribes. Of game birds there are wild turkeys, ducks, partridges, pinnated grouse or prairie hens, quail, etc. Of the birds of the State, there were exhibited at the Centennial the bald eagle and the royal eagle, as well as the following:

Wild duck, crow, house-wren, blue bird, bobolink, sapsucker, red-headed woodpecker, blue jay, kingfisher, paroquet, flicker, bird hawk, robin, meadow lark, mocking bird, red bird, mammoth woodpecker, cock of the woods and the snake-killer or water turkey.

The rivers, lakes and bayous are well stocked with fish, among which are pickerel, black bass, buffalo-fish, cat-fish and shad, while the mountain streams have an abundance of perch, roach and trout. In the bayous, lakes and in the Red, Ouachita and Arkansas rivers the alligator sometimes makes his appearance, though he is less common than in Louisiana or Texas.

The copperhead, the milk adder and other reptiles, venomous

and harmless, are plentiful in the lowlands, and the rattlesnake and moccasin snake are found in the hills.

The insect tribes in Arkansas are exceedingly numerous in the lowlands, and well deserve the name of pests. The mosquito of this region is renowned for his size, vigor and venom, and the most fabulous stories are related of his strength and audacity. In the hills, however, this insect is less troublesome. The bot-fly, the tick, the chigoe and the guinea-worm are very annoying to man and beast. The cotton worm, the army worm and several flies are destructive of vegetation. Some of the pests found a little farther north, such as the Colorado beetle and the Rocky Mountain locust, have not visited Arkansas in any considerable numbers.

Archæology.—There are no ruins of ancient cities or towns, indicative of its having been, in the remote past, the home of a semi-civilized race, in Arkansas. Neither the Aztec nor the Toltec race seem to have penetrated so far to the East. When De Soto visited what is now Eastern Arkansas in 1541, the Natchez, a tribe now extinct, were in possession there, and 140 years later de La Salle found them in possession, while the Quapaws were in the northeast, and the Osages in the western part of the State. Of one or other of these tribes, mounds and relics have been found in Hot Springs, Garland, Montgomery and Phillips counties. Some of these were exhibited at the Centennial, and consisted of vases, water carriers, bowls, mortars, pestles, rollers, discoidal stones, scrapers, skin dressers and polishers, axes, hatchets, lances, darts, pipes, beads, amulets, ponays or Indian money, hand hammers, sling balls, balls for games, plough points, knives and drills.

The change in the character of the population is also marked. In its early days, both as a Territory and a State, it had within its borders a great number of outlaws—ruffians, gamblers, highway robbers, murderers, horse-thieves and brigands. Human life was not safe, and crime was rife. Every man went armed, and the “soft notes of the pistol” were heard everywhere day and night; while a man was made an offender for a word, and was often shot down in sheer wantonness. The natural conse-

quence of this state of things was that the better disposed part of the community were compelled to take the law into their own hands. Vigilance committees were appointed, and when the outlaws found their occupation gone, they retaliated by banding themselves together as "Regulators" and raiding the settlements. For some years a desperate warfare was waged between these outlaws and the rest of the community, and the services of Judge Lynch were often called for.

At length law and order triumphed; the outlaws were driven out, and peace and quiet were established. It was time. Business was paralyzed; and ignorance and brutishness prevailed. In this partial restoration to order, some attention was paid to education, and from 1850 to 1860 there was a rapid growth, the population doubling, and a decided advance being made in the social condition of the people. The number of slaves was very large, and some of the worst evils of slavery were rife there. With the commencement of the war, the old outlaw spirit revived, and for some years there was anarchy again. But the friends of law and order were, after a time, in a majority, and they have succeeded in putting down ruffianism completely. The era of railroads was late in opening in Arkansas, but it helped materially in producing order, enterprise and development in the State.

CHAPTER III.

CALIFORNIA.

CALIFORNIA is one of the largest States of "Our Western Empire," and stretches for 700 miles along the Pacific coast. It is between the parallels of $32^{\circ} 28'$ and 42° north latitude, and between the meridians of $114^{\circ} 30'$ and $124^{\circ} 45'$ of west longitude from Greenwich. It formed a part of the territory ceded by Mexico to the United States at the close of the Mexican war, and is bounded north by Oregon, east by Nevada and Arizona, south by Lower California, and west by the Pacific Ocean. The Pacific coast of California trends southward from the Oregon line.

to Cape Mendocino in latitude 40° , and thence in a nearly southeasterly direction to the coast of Lower California. The area of the State is 188,981 square miles, or 120,947,840 acres, or about the combined areas of New York, New Jersey, Pennsylvania, Ohio and Michigan. Its length is 700 statute miles, and its average breadth more than 200 miles.

Topography.—The mountain systems of California are vast in extent, diversified in character, rich in mineral wealth, and unsurpassed in beauty and grandeur of scenery. They may be considered under two great divisions: the Sierra Nevada or Snowy Mountains, on the eastern border, stretching with its spurs over a breadth of about seventy miles in a series of ranges; and the Coast Range, which, in its several chains, includes about forty miles in breadth, extends near the coast the whole length of the State and into Lower California. These two ranges unite near Fort Tejon in latitude 35° and again in latitude $40^{\circ} 35'$, and separating again form the extensive and fertile valleys of the San Joaquin and Sacramento. The two lines of ranges of the Sierra Nevada may be traced in regular order for a distance of nearly seven degrees by their two lines of culminating crests, which rise in varying heights from 10,000 to 15,000 feet above the sea. There does not seem to be as much order in the position and direction of the summits of the Coast Range, peaks of widely varying heights and entirely different mineral constitution being found in close proximity. The summits of the Coast Range vary in altitude from 1,500 to 8,000 feet. The highest peaks of the Sierra Nevada are Mount Shasta, Lassens Butte, Spanish Peak, Pyramid Peak, Mounts Dana, Lyell, Brewer, Tyndal, Whitney, and several others of less note. Those of the Coast Range, though richer in minerals, are less lofty and less noted.

On the eastern side of the crest line of the Sierra Nevada are a chain of lakes, including the Klamath lakes, Pyramid, Mono and Owen lakes, lying wholly east of the range, and Lake Tahoe, a gem of the purest crystal water, far up in the mountains, occupying a depression between two summits. The depression, in which most of these lakes are situated, continues southward

to the entrance of the Gila river into the Colorado. For a considerable distance northward from the southern limit of the State it is many feet below the ocean level, and geological investigations show that it was once the bed of a large lake or estuary communicating with the ocean by a somewhat narrow strait. It has recently been proposed to reopen this strait as a ship canal, which could be done at a very moderate expense, and thus restore this ancient land-locked sea, to modify the climate, and remove the drought from a region once populous, but now excessively arid.

A similar depression, though not quite so extensive, exists on the western slope of these mountains for a width of about fifty miles, and contains several lakes.

The region lying east of the Sierra Nevada is called the eastern slope; that between the foot-hills of the Sierras and the Coast Range is known as the California Valley, and that west of the Coast Range is called the Coast Valley, or simply the Coast. Another geographical division is made by drawing an east and west line across the State in the latitude of Fort Tejon, that part of the State lying south of this line being called Southern California. The country between this line and one extending east and west through Trinity, Humboldt, Tehama and Plumas counties is called Central California; all north of this is known as Northern California. Central California contains about three-fourths of the known wealth and population of the State.

The Monte Diablo division of the Coast Range, about 150 miles long by 50 miles wide, is a striking landmark of the State when approached by sea, and from its summit may be obtained the finest views of the varied scenery and landscapes of California which can be found anywhere.

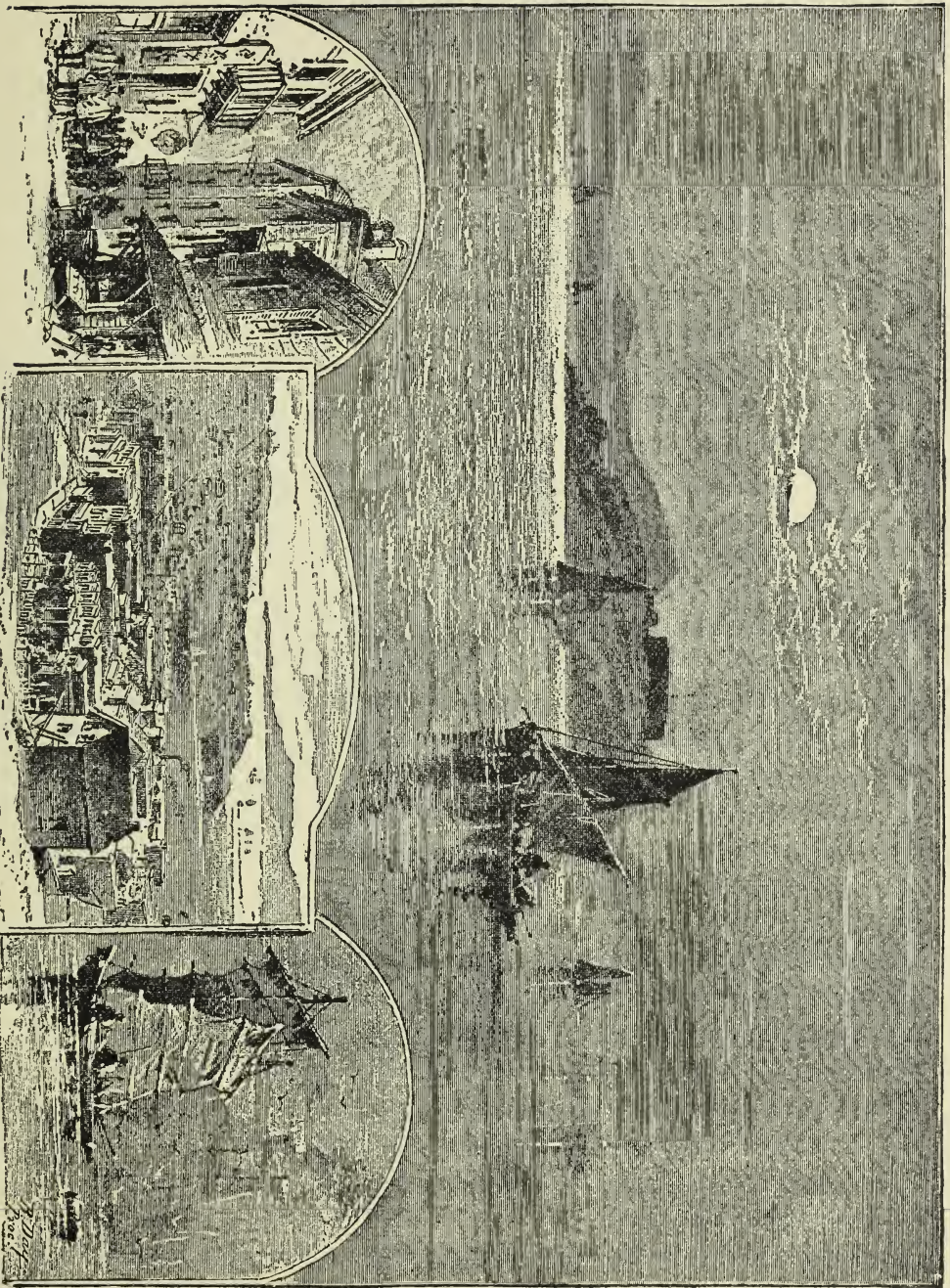
The valleys of the Sacramento and the St. Joaquin, though the largest, are by no means the only valleys of California. There are hundreds of them of greater or less extent, and many of them remarkable for fertility and beauty. East of the Sierras, in Southern California, some of these valleys, the deepest portions of a former extensive inland sea, are now salt lakes and

are surrounded by most forbidding and unpleasant scenery. In Mono, Fresno and Kern, Inyo and San Bernardino counties there are several of these salt lakes, and in the last-named county, among the other evidences of volcanic action, is that combination of horrors known as the sink of the Amargoza river or "Death Valley." It is 150 feet and probably more below the level of the sea, intensely hot, dry, and sulphurous.

California is, for the most part, well watered, but the Coast Range limits the length of its navigable rivers except in two or three instances. The Rio Salinas is the only navigable river on the coast which discharges directly into the Pacific below Cape Mendocino, but the Sacramento river from the north and the San Joaquin from the south, large and navigable rivers, both discharge into the beautiful Bay of San Francisco. The Klamath river at the north, rising in the Klamath lake, flows through a crooked valley to the ocean, but is not navigable for any considerable distance. This is also true of the other rivers north of the Golden Gate. Most of the rivers east of the Sierras, in the long, depressed basin already described, discharge into lakes in the basin, and have no connection, direct or indirect, with the ocean.

The harbor of San Francisco is the finest on the whole Pacific coast, fifty miles in length by nine in width, landlocked and approached by the Golden Gate, five miles in length with a width of one mile, and having nowhere less than thirty feet of water. That of San Diego, at the southern extremity of the State, is next in importance, and, with its railway connections soon to be completed, will prove a formidable rival to that of San Francisco. The other harbors, ten or twelve in number, are either shallow or not well protected from violent winds, and need breakwaters or other improvements. There are many islands along the coast, some of them small and rocky, like the Farallones off the Golden Gate, and inhabited only by seals, sea-lions, and aquatic birds; others are large and adapted to grazing or cultivation.

The amount of arable lands in California, including those which only require irrigation to make them productive, and are so situated that they can be irrigated, and the swamp or *tulé*



CHINATOWN.

SAN FRANCISCO BAY AND HARBOR.

CHINESE FISHERMAN.

lands which, when reclaimed and protected from overflow, yield the largest crops in the world, is estimated at not less than 60,000,000 acres, or about one-half the area of the State; the grazing lands on the mountain slopes and on the sides of the valleys are estimated at 40,000,000 acres more, and the forest areas, much of them too steep for cultivation, were officially stated at 9,604,607 acres in 1872, but have been considerably diminished since that time. There are then somewhat more than 10,000,000 acres which, from one cause or other—some being under water, some volcanic and barren, or arid and not irrigable, or bald and bare mountain peaks—are worthless. This is, however, but one-twelfth of the area of the State.

Geology and Mineralogy.—The Coast Range and its foot-hills generally belong to the tertiary system, but at San Pedro bay (about latitude 34°) the cretaceous rocks come to the coast, to be replaced at the mouth of the Margarita river (about $33^{\circ} 10'$) by quaternary or recent alluvial deposits which extend to the southern line of the State. It is these alluvial deposits which General Frémont believes have filled up the ancient strait or estuary which led to the now dry and desert site of the inland sea, which formerly occupied a large part of Southeastern California, and which he urges our government to re-open and thus render an extensive portion of Western Arizona and Southeastern California again habitable.

At two points of the Coast Range, viz.: at the Monte Diablo mines, in Contra Costa county, nearly east of San Francisco, and in Mendocino county (about latitude $39^{\circ} 30'$), the tertiary coal or lignite crops out in extensive beds. The first of these has been worked for many years, and produces a fair burning coal, of which about 150,000 tons are annually sent to market.

The valleys lying between the Coast Range and the Sierras belong mostly to the cretaceous formation, though in the extreme south they are overlaid by alluvial sands. There is very little gold in these valleys except in placers which have been washed down from the mountains, though occasionally pockets, and possibly true veins, have been found in metamorphic rocks belonging as high up in the series as the cretaceous. This may be due to volcanic action in ages long past.

The greater part of the auriferous and argentiferous rocks of the State belongs to the triassic and Jurassic strata, which form the surface rocks of the Sierra Nevada from the Columbia river nearly to the head of the Gulf of California. It is in these triassic and Jurassic strata that most of the gold and silver deposits from the Rocky Mountains to the Pacific occur. South and west of the sierras, and in the vicinity of the upper waters of Kern river and its tributaries, is an extensive volcanic region, where basaltic and porphyritic rocks, sulphurous and chalybeate springs, deposits of sulphur and large tracts of lava and lava ashes are found. A somewhat similar though much smaller tract exists in Sonoma county, between two spurs of the Coast Range. There are geysers here, and other indications of former volcanic action. Much of the region east of the sierras is of recent formations, though modified by former volcanic action, and is forbidding to the last degree. The lakes or sinks, often very deep, are always salt and bitter, and often without water most of the year. The beds of the lakes are covered with alkaline deposits. The famous Death Valley, the Dry Lakes, of which there are at least a dozen, Dry Salt Lake, Owen's Lake and other sinks of this region give striking evidence of its former volcanic character, and of the great changes which have taken place, some of them within modern times in this part of the State. The earthquakes of 1871 were most violent in this section, especially in Kern, Inyo, and San Bernardino counties.

Mineralogy.—Gold is found pure, in scales, fine dust, in nuggets and in crystals, and in combination with copper, silver, lead, zinc, cinnabar, arsenic, iron, sulphur, tellurium, iridosmine, etc. Silver is found native, though very rarely, as a chloride (horn-silver), in combination with lead as argentiferous galena, sulphurets and carbonates of silver and lead, with copper as copper glance, red silver ore, etc., and with several of the rarer metals as well as with sulphur, iron, etc. Copper exists in the form of native copper, and as malachite, copper glance, rubescite, azurite, chalcopyrite and chrysocolla, in combination with sulphur, etc. Mercury or quicksilver appears as cinnabar very abundantly throughout the Coast Range, as coccinite in Santa Barbara,

and native in the Pioneer claim and elsewhere. There are now about sixty mines of quicksilver in the State, and the supply increases with the ever increasing demand.

Platinum has only been found in California in placers, though its occurrence in veins with gold or silver is not improbable. Tin is found as cassiterite or binoxide of tin in the Temiscal range about sixty miles from Los Angeles, and in grains elsewhere. Lead is abundant as galena all over the State, and in many cases carries a considerable percentage of silver. The molybdate of lead (Wulfenite) occurs in one or two localities. Arsenic occurs pure in Monterey county, and as arsenilite in one or two counties, and is extracted as white oxide in smelting several ores. Iron exists in various forms, as chromic iron, as hæmatite, as magnetic and specular ores, and as oxide or bog iron ore in several localities. Tellurium occurs native and in combination with gold and silver and copper, and forms one of the most refractory of ores. Diamonds (so called) are found in several localities, but are not probably the genuine article, though they possess many of the properties of the diamond. Graphite occurs in Tuolumne county and elsewhere; borax and boracic acid in one or more lakes and in the marshes adjacent; salt as rock-salt, as brine, and evaporated from the sea water and from the numerous salt lakes; soda, both as caustic soda in deposits of a hundred feet or more in thickness and of great extent, and as carbonate of soda around some of the alkaline lakes, and in the volcanic valleys; sulphur, pure, and in sulphurets and sulphates; gypsum, barytes, antimony, ochre, alabaster, fluorspar, corundum, and cobalt in the form of erythrine, abound in various parts of the State. Magnesite, iridosmine, magnetite, limonite, tourmaline, pyrolusite (binoxide of manganese), zircon, garnets, chrysolite and haysine are the other principal minerals. Coal, as already stated, occurs in several localities. Petroleum and bitumen are found in several of the coast counties, and the former, after many mishaps and failures, has become one of the standard products of the State, and is now supplying a considerable part of the local demand.

Mines and Mining.—California is one of the great mining

States. Her production of the precious metals has been larger than that of any other State or Territory, though Nevada has approached it, and amid all changes, and with the exhaustion of the ordinary placer-mining, the State has still maintained a very large yield, and is likely to increase rather than diminish it. Gold or silver or both have been discovered in paying quantities in eighteen counties of the State and possibly more. Of these counties all (except Humboldt, Klamath and Del Norte, which have deposits only in the shore and beach sands, being all coast counties, and Los Angeles, in which silver mines have recently been discovered) are situated along the eastern or western slopes of the Sierra Nevada; some of them extending also across the valley to the eastern foot-hills of the Coast Range. These counties, with the character of their product and the processes used in obtaining it, are as follows, beginning with the southernmost: 1. *Inyo*—silver mines in veins or lodes, mostly in Owen's valley and on the western slope of the Inyo or Buena Vista Mountains, one of the parallel ranges of the Sierra Nevada, from twelve to thirty miles southeast of the head of Owen's Lake. There are 700 or 800 claims here, and many of them are worked successfully.

2. *Mariposa county*, lying on the western slope of the main range of the Sierras, and having the famous valley of the Yosemite within its borders. The mines are mostly in the west and southwest part of the county, and the greater part of them, on the Mariposa estate, were once the property of General Frémont. Besides these there are the Oaks and Reese mines, which are largely productive. These are gold only, and in quartz veins.

3. *Tuolumne county*, lying immediately north of Mariposa on the western slope and foot-hills of the Sierra. The mines, mostly gold, though there are a few silver, and all in veins or lodes, are in the west and southwest portion of the county. There are somewhat more than fifty mines.

4. *Calaveras county*, situated northwest of Tuolumne, but on the same range. The mines are scattered throughout the county. There are many gold mines in quartz veins, and extensive placers (of gold), but they are very nearly exhausted.

5. *Amador county*, immediately north of Calaveras, a small county, but rich in gold deposits. It has twelve or fifteen mines, mostly in the western part of the county, gold in quartz veins, and yielding well.

6. *Eldorado county*, the county in which gold was first discovered. This county is partly in the Sacramento valley, and is drained by one of the affluents of the Sacramento river. The mines (gold in quartz veins), which have always been productive, though the placers have long since given out, are situated mostly in the western part of the county. There are a dozen or more large stamp mills and a greater number of mines.

7. *Placer county*, north and northwest of Eldorado. Lake Tahoe is mostly in this county, and the Central Pacific Railway traverses the entire length of the county from southwest to northeast. There are many placers and large deposits in the former beds of what are known as "dead rivers," which are being worked by the process of hydraulic mining. There are also some quartz veins which yield liberally. The product is gold exclusively. There are about forty mines and placers now worked.

8. *Nevada county*, north of Placer county, is probably the richest of all the counties of California in mineral wealth. Its gold mines and placers, many of them very rich, are scattered all over the county. Its placer gold is nearer to absolute purity than that of any other mines or placers in the State. Of the 130 placers recorded, the gold product in most ranged from 900 to 976 (absolutely pure gold being 1,000), and the "You Bet" claim gold assayed 994. The gold from the thirty-seven quartz veins of the county did not assay quite so high, but ranged from 798 to 875.

9. *Sierra county*, north of Nevada county, is noted for its hydraulic mining. Through this county, on a ridge one or two hundred feet above the adjacent lands, is the ancient bed of a river, which the miners know as the Big Blue Lead, whose sands, for a depth of five or six feet or more, and for a distance of probably a hundred and ten miles, were rich with gold. It had been upheaved in the volcanic changes through which the Sierras

have passed, and wherever living streams cross its ancient bed with their deep cañons, they wash down rich masses of gold dust. The miners have been breaking down the blue gravel of this "dead river" bed by tunnels, blasting, and the hydraulic process, for the past twelve or thirteen years, and have reaped a rich harvest. In this county was found, in August, 1869, a nugget of gold weighing 95½ pounds, worth \$21,156.52.

10. *Yuba county*, southwest of Sierra, is also a famous county for hydraulic mining, having five or six large deposits of gold.

11. *Butte county*, west of Yuba, has many quartz veins rich in gold. Seven or eight large mines are worked.

12. *Plumas county*, north of Sierra, has in the eastern and central portions of the county fifteen or twenty gold mines, some of them hydraulic, others quartz mines.

13. *Alpine county*, situated on the extreme eastern border of the State, on the crest of the Sierras, between latitude 38° 20' and 38° 50'. The ores here are sulphurets and antimonial sulphurets; in all of them silver predominates, in some with a liberal percentage of gold, in others with considerable copper. The claims, which are very numerous, are all of them worked by opening adits or tunnels. This requires more capital at first, but is necessary in so mountainous a region. The mines, so far as developed, yield very well,—from \$40 to \$75 per ton of ore,—though there are difficulties in the reduction.

14. *Shasta county*, in the northern part of the State, the forty-first parallel passing through it, has deposits and quartz veins of gold and copper. The gold mines yield either free-milling gold or gold combined with sulphurets of copper, lead or zinc. The mines, eight or ten in number, which are worked, are in the western part of the county.

15. It has generally been supposed that the western slope of the Coast Range was barren of ores of the precious metals, but recent developments show that the silver-bearing ledges are found there as well as on the eastern slope of the same range, or on both slopes of the Sierra Nevada. Los Angeles county, in the southern part of the State, on the coast, has hitherto been regarded as the finest agricultural county in the State, but

recently there have been discovered extensive veins of silver there, and numerous mines are clustering around Silverado in the southern part of the county. The ore is argentiferous galena (sulphurets of silver and lead), and the assays range from \$18 to \$200 per ton.

The beach deposits of Del Norte, Klamath and Humboldt counties of gold in iron sands are not simply those found in the sands washed by the tides, and which are common to all coasts which have rivers discharging into a sea or ocean from gold-bearing mountains; these sands, though extending ten miles out from the coast, contain gold in such small quantities, as hardly to repay the labor of collection; but they occur in terraces or old beaches and bluffs, sometimes two or three miles back from high-water mark, and from 250 to 1,200 feet above the sea. In these bluffs or terraced beaches are extensive layers of iron sand, rich in gold, and varying in thickness from a few inches to three or four feet. The miners call this terrace-mining. Several of these strata have been discovered, one at five miles below Trinidad, in Klamath county, one at Crescent City, in Del Norte county, one in Humboldt county, and one at Randolph, Curry county, Oregon. These terraces indicate either an upheaval of the coast or a retrograding of the ocean.

The falling off in the production of silver in the Comstock lodes of Nevada has produced a reaction in favor of the gold placer and quartz mines of California, and there is at the present time a considerably greater activity in gold mining in California, than at any time for the last fifteen years. All the gold mines in the counties named above have been reopened, and are now actively worked with a greatly increased production; more than a hundred new quartz mills have been erected within the past year and a half, and are now actively at work, and many new mines and placers have been opened and developed in the counties which have previously yielded gold, while Trinity, Klamath, Fresno, San Bernardino, and Mendocino counties are added to the list of mining counties. It is confidently predicted that the gold yield of California, now on, will be much greater than in any year since 1866.

Soils and Vegetation.—"In a region of such vast extent," says Professor E. W. Hilgard, "traversed by mountain ranges formed of rocks of all kinds and ages, there is, of course, an endless variety of soils, to describe all of which would exceed our limits, even if the data were available. Unfortunately this is far from being the case, the geological survey" (of which Professor Hilgard was the chief) "having paid but little attention to the examination of soils, which, it is true, is a subject requiring special qualifications and care on the part of the observer to insure useful results. There are, however, some general features developed on a large scale in the more thickly settled parts of the State, a brief summary of which may find an appropriate place here."

"It is well known that the main axis of the Sierra Nevada is formed by granitic rocks, which in the northern portion of the range, as well as on the slopes, are usually overlaid by clay slates and shales, forming the proverbial 'bed-rock' of the gold-placers and gravel-beds. The soil derived either directly from the granites or from the older portion of the slates—in other words, the gold-bearing soil of the Sierra slope—is an orange-colored (commonly called 'red') loam, more or less clayey or sandy according to location, and greatly resembles, on the whole, the older portion of the 'yellow loam' subsoil of the Gulf States. Of course it contains much more of coarse materials in the shape of undecomposed rock, and its sand-grains are sharp instead of rounded. It is the predominant soil of 'the foot-hills,' and where ridges extend from these out into the Great Valley, they are usually characterized by the red tint, which gradually fades out as the ridges flatten into swales in their approach to the San Joaquin and Sacramento rivers, being lost in the gray or black of the 'adobe,' or the buff of the river-sediment soils. Its admixture is everywhere, I believe, found to be advantageous to the other soils; and in the foot-hills themselves it proves to be highly productive, as well as durable, easy of tillage, and what is termed a 'warm' soil. The rocks of the lower slope of the Sierra, but more especially those of the Coast Range opposite, are predominantly of a very clayey character, soft gray clay

shales and laminated clays alternating with ledges of soft clay sandstone and brittle hornstone. Their mechanical and chemical decomposition results, therefore, in the formation of gray, buff, or sometimes almost white clay soils, which occupy the hill-sides and higher portions of the valleys, while in the lower portions the admixture of vegetable matter, especially in the presence of a comparatively large amount of lime, causes them to appear dark, and often coal-black. These soils constitute the 'adobe,' so often mentioned in connection with California agriculture. They are substantially the same, both as to tilling qualities and chemical composition, as the prairie soils of the Western and Southern States. Like these, they are rich in plant food, durable and strong, yielding the highest returns of field crops in favorable seasons and under good culture, but sensitive to extremes of wet or dry seasons, and of course more in cultivation, as well as more liable to crop failures, than lighter soils.

"During the dry season the adobe soil, unless it has been very deeply and thoroughly tilled, becomes conspicuous by the wide and deep gaping cracks which traverse it in all directions, sometimes to a depth of several feet, precisely as in the 'hog-wallow prairies' of the Southwestern States. Of course the effect of rains is here also similar in causing a bulging up of the masses between the cracks when the material which has fallen into the latter expands forcibly on wetting. Hence the 'hog-wallow' surface is as familiar in California as in Texas; and the fact that a traveller outside of the Sierras in the dry season is rarely out of sight of some such land is eloquent as to the wide prevalence of the 'adobe.' On the steep hillsides of the Coast Range the sun-cracks aid in giving foothold to stock; and during the rainy season the water running into them to the bed-rock causes numberless land-slides, such as gave rise to the memorable case of Hyde *vs.* Morgan. As it is well ascertained that at a former geological period the entire interior valley, as well as the Bay of San Francisco, was fresh-water lake basins, the bulk of the adobe soil would seem to represent ancient lake, or rather, perhaps, swamp deposits, which are therefore found in corresponding

positions in most of the connecting valleys. On the bay we find usually only a narrow strip of sandy soil running along the beach; inland of this a level belt of black adobe (or at times salt marsh), from which there is a gradual ascent toward the foot of the Coast Range, the soil becoming lighter colored and mingled with bowlders and rock fragments. The nature of the materials, as well as the form of portions of this slope, characterizes them almost inevitably as the result of glacial action.

"The peninsula on which San Francisco is situated is overrun with the dune sand drifted from the ocean beach for a distance of several miles south from the Golden Gate, so that the fixing of the sand and its conversion into soil is one of the chief problems of the gardens and parks of that city. The city of Oakland, also, is situated on a somewhat sandy, but nevertheless quite productive, soil; and land of a similar character, but stronger by admixture of the adobe, yet easily tilled, forms the soil of the fertile valleys in the plain lying between the eastern shore of the bay and the Coast Range, which are largely devoted to market-gardens and fruit-culture, and, farther from the cities, to that of barley. The comparative difficulty and more or less of uncertainty attendant upon the cultivation of the adobe soils, unless very thoroughly tilled, has caused a preference to be very commonly given to the lighter soils found nearer to the streams, which are formed of a mixture of the adobe with the river sediment, or, nearest the water-courses, of that sediment alone. It is suggestive of the character of the majority of California streams that the word 'bottom,' used east of the mountains to designate the well-defined flood-plain, is scarcely heard in the State, the more indefinite and general term 'valley' being in general use. The obvious reason is that there is in most cases no very definite terrace, but a rather gradual slope from the bank to the bordering hills. The Sacramento and San Joaquin have not, as a rule, raised their immediate banks perceptibly above the rest of the flood-plain, because the sediment they carry is not such as will subside at the slightest diminution of velocity, but is apt to be carried some distance inland. At the points of its upper course the San Joaquin, and in the lower

portions both it and the Sacramento, subdivide into numerous sloughs traversing wide belts of more or less marshy flats, subject to overflow, and covered with a rank growth of 'tule.' This name applies, strictly speaking, to the round rush (*Scirpus Lacustris*), which occupies predominantly the tide-water marshes, here as well as on the Gulf of Mexico. The farther from salt water, however, the more it is intermingled with (or locally almost replaced by) other aquatic grasses, sedges, and cat-tail flag (*Typha*), affording, together with the young 'tule,' excellent pasture nearly throughout the year. Here as elsewhere in such districts, the cattle soon acquire the art of keeping themselves from getting bogged, by maintaining a sort of paddling motion when on peaty ground, while draught-horses require to be provided with broad 'tule-shoes.' These tule lands, embracing a large number of rich and partly reclaimed islands, such as Union, Brannan, Sherman, and others, forming part of the counties of Sacramento, San Joaquin, and Solano, continue with varying width along the east shores of Suisun and San Pablo bays, and up the tributary valleys of Napa, Sonoma, and Petaluma, nearly to the limit of tide-water. It is noteworthy that, as regards salubrity, the tules, at least so far as they are within reach of brackish tide-water, are less liable to malarious fevers than the upper portions of the great valleys.

"The soil of the tule lands is of two principal kinds: sediment land, found chiefly along the Sacramento and other streams, carrying much 'slum' from the hydraulic mines; and peaty land, more prevalent along the San Joaquin and its branches. The latter kind consists almost entirely of tule roots, in various stages of freshness and decay, to a depth of from two to twenty and more feet; in the latter case we have the 'float land,' which rests on the water-table and rises and falls more or less with it. Like the 'Prairie Tremblante,' near New Orleans, it often trembles under the tread of man, but will nevertheless sustain herds of cattle without the least danger, its bulges forming places of refuge for them in time of high water. An excellent fuel has been made by pulping this mass and forming it into bricks like true peat.

“The tule lands were long thought to be worthless except for pasture purposes; but it has now come to be well understood that they are in large part of extraordinary fertility, and, if protected from overflow by levees, are almost sure to yield abundant crops every year, even in seasons when those of the uplands fail for want of moisture. In their reclamation the construction of levees is of course the first thing needful. The sediment land can then be taken into cultivation at once by the use of large sod-plows, resembling the prairie plows of the Western States. It is usual to burn off the rushes and native grasses previous to plowing, especially in the peaty lands where the plow would otherwise find no soil. But here the fire penetrates several feet down, either to the underlying soil or to moisture, leaving behind a layer of ashes so light that the plow is useless. At the proper season grain is then sown upon the ashes, and either brushed in or trodden in by sheep, and extraordinary grain-crops are thus produced during the first years, the duration of fertility depending, of course, upon the soil underlying after the ashes have been exhausted. The tule lands bordering upon Tulare lake are of a different character from those of the lower rivers. The soil is heavy, consisting of fine sediments mixed with gray clay and shell *débris*, contains a large supply of plant food, and with proper cultivation will doubtless prove as highly productive as are the soils of the Great Tulare plains themselves.

“The soils of the Mojave desert seem on the whole to be rather light, whitish silts, of whose possible productiveness little can as yet be said, except that without irrigation culture is hopeless. In striking contrast with these close soils of the San Joaquin valley are those which prevail south of the Sierras, San Fernando, and San Gabriel, in the Los Angeles plain and its tributary valleys, the home of the orange, lemon, and olive in their perfection. The fine rolling uplands (‘*mesas*’) of that region are generally covered with a brownish, gravelly loam, from eight to twenty feet in thickness, which, with tillage, assumes the most perfect tilth with ease. It is a generous, ‘strong’ soil, varying locally so as to adapt itself to every variety of crop, yet readily identifiable by its general character from Los Angeles to

San Diego. In most respects it may be considered a variety of the red soils of the Sierra slope already described, like which it appears to be pre-eminently adapted to fruit culture.

"The soils of the plain to seaward of Los Angeles, and of the coast plains south of Santa Barbara generally, so far as not modified by the sediments of the streams, seem to be uniformly characterized by a very large amount of glistening mica scales, distributed in a rather sandy, dark-colored mass, destitute of coarse materials. They are easily cultivated and highly productive when irrigated, although not unfrequently afflicted with a certain taint of 'alkali.' This, however, when not too strong or salt, is here readily neutralized by the use of gypsum.

"'Alkali' soil is the name used in California to designate any soil containing such unusual quantities of soluble salts as to allow them to become visible on the surface during the dry season, as a white crust or efflorescence. They are of course found chiefly in low, level regions, such as the Great Valley, and the plains to seaward of the Coast Range; sometimes in continuous tracts of many thousands of acres, sometimes in spots so interspersed with non-alkaline land as to render it impossible to till one kind without the other. The nature and amount of salts in these soils is of course very variable. Near the coast the 'alkali' is often little more than common salt, and can be relieved only by drainage or appropriate culture. At times we find chiefly magnesian salts, when liming will relieve the trouble. But in the Great Valley the name 'alkali' is in most cases justified by the nature of the salt, which almost always contains more or less carbonate of soda, and sometimes potassa. The presence of these substances, even to the extent of a fourth of one per cent., while it may do but little harm during the wet season, results in their accumulation at the surface whenever the rains cease, and the corrosion of the root-crown, stunting, and final death of the plants. But when stronger, as is too often the case, the seed is killed during germination. Moreover, land so afflicted cannot be brought to good tilth by even the most thorough tillage. Fortunately, a very effectual and cheap neutralizer of this, the *true* 'alkali,' is available in the form of gypsum, which transforms

the caustic carbonates into innocent sulphates. Wherever the amount of alkali present is not excessive, the use of gypsum relieves all difficulties arising from the presence of the former. Moreover, analysis shows that in many cases large amounts of important mineral plant-food, such as potash, phosphates, and nitrates, accompany the injurious substances; so that when the latter are neutralized, the previously useless soil may be expected to possess extraordinary and lasting fertility. Abundant deposits of gypsum have been shown to exist in many portions of the State since attention has been directed to its importance in this connection.

“On the eastern affluents of the Sacramento river, the American, Bear, Yuba, Feather, and other streams heading in the region where hydraulic mining is practised, a new kind of soil is now being formed out of the materials carried down from the gold-bearing gravels. The enormous masses of detritus washed into the streams, filling their upper valleys to the height of sixty feet and more with boulders and gravel, while a muddy flood of the finer materials overruns the valley lands in their lower course, have given rise to a great deal of complaint on the part of farmers; and the ‘mining *débris* question’ has been the subject of numerous lawsuits, and of much angry debate in the legislative halls. In some cases the lands so overrun are definitively ruined; in others the new soil formed is of fair quality in itself, but as yet unthrifty; in many, the best quality of black adobe is covered many feet deep with an unproductive ‘slum.’ By the same agency, the beds of the Sacramento and its tributaries have become filled to such an extent as to greatly obstruct navigation and to cause much more frequent overflows, whose deposit, however, appears to improve, in general, the heavy lands of the plain, as well as the tules. It is difficult to foresee a solution of this question that would be satisfactory to all parties concerned; the more as the navigation of the bay itself is beginning to suffer from the accumulation of deposit, the reddish sediment-bearing waters of the Sacramento being always distinguishable in front of the city from the blue water brought in by the tides.”

Much of the soil of the State, especially of the mountain slopes, is peculiarly adapted to the growth of gigantic forest trees. Of these there have been recognized and described forty-eight genera and one hundred and five species in the State, the greater part of which are not only indigenous but only to be found on the Pacific slope. Of these forty species are evergreens, found mostly on the mountains of the Coast Range and the Sierras. The most remarkable of these are the two species of *Sequoia*, *Sequoia gigantea*, or mammoth tree, and *Sequoia sempervirens*, or California Redwood. Of the former there are nine groves known in the State, though the largest trees have been felled by the barbarity of the showmen, who could not be contented without despoiling the forests of their monarchs, the growth of thousands of years, only that they might exhibit their own meanness and brutishness for a miserable pittance. Some of these trees were more than 450 feet in height, with a circumference near the ground of not less than 120 feet. The giant *Eucalypti* of Australia may have had a somewhat greater circumference, but they were not as tall as these. The largest now standing is said to be 376 feet in height and 106 in circumference.

The Mariposa and Calaveras groves are the best known, though not the largest, of these collections of mighty trees. Mr. A. R. Whitehill, of the Chicago *Tribune*, who has recently visited several of these groves, thus describes the "Grizzly Giant," and the Mariposa grove in that paper:

"The principal tree in the grove is the one known as the 'Grizzly Giant,' and the eye and sense of the spectator are at once bewildered at the size of its mighty proportions. At the base of this tree the carriage road stops, and the trail for horses begins. Carefully measuring the circumference with a line carried for that purpose, we found it to be over ninety-three feet at the base, and this not counting the burnt-away portions, which would have made the total still greater. We measured thirty-one feet as the diameter. At the base were five openings, any one of which seemed large enough for the accommodation of a camping party; and immediately around these the bark was gone. From the ground to a height of about eleven feet the

tree contracted perceptibly; then, perfectly round, it shot up with scarcely a change to the lowest limbs, which were fully 100 feet from the ground. On one side were about ten limbs, varying from two to six feet in diameter, and on the other about twelve almost as large. The largest limb was probably 150 feet from the ground, and this was fully twenty feet in circumference where it left the trunk. Shooting out in a straight line for a distance of thirty feet or more, it curved then suddenly upward in a perpendicular direction, and, at a distance of seventy-five feet more, was lost in the upper foliage. Secondary branches, as large as a full-grown eastern oak, shot out from this primary branch as a trunk, and there again produced other branches, to the third and fourth generation. Some of these branches were decayed; some were moss-covered; some were in the full vigor of their extraordinary growth. The top of the tree seemed to have been broken off, perhaps by lightning; and the appearance of the whole was that of a war-worn veteran of the Sierra.

"It was near dusk when we had finished our inspection of this mighty tree. We were over a mile above the level of the sea, and six miles from our stopping-place for the night. Still we lingered. Although it was then June, yet the eternal snows of the mountains were everywhere around us, and, as the huge banks and drifts stretched away off in the distance, the melting power of heat and the elements was on every side defied. Not a weed or blade of grass relieved the monotony of the view; not the chirping of an insect or the twittering of a bird was heard. The solemn stillness of the night added a weird grandeur to the scene. Now and then a breath of wind stirred the topmost branches of the pines and cedars, and, as they swayed to and fro in the air, the music was like that of Ossian, 'pleasant, but mournful to the soul.' There were sequoias on every side almost twice as high as the Falls of Niagara; there were pines rivaling the dome of the Capitol at Washington in grandeur; there were cedars to whose tops the monument of Bunker Hill would not have reached. There were trees which were in the full vigor of manhood before America itself was discovered; there were others which were yet old before Charlemagne was

born; there were others still growing when the Saviour himself was on the earth. There were trees which had witnessed the winds and storms of twenty centuries; there were others which would endure long after countless generations of the future would be numbered with the past. There were trees crooked and short and massive; there were others straight and tall and slender; there were pines whose limbs were as finely proportioned as those of the Apollo Belvidere; there were cedars whose beauty was not surpassed in their counterparts of Lebanon; there were firs whose graceful foliage was like the fabled locks of the gods of ancient story. It was a picture in nature which captivated the sense at once by its grandeur and extent; and, as we drove back through six miles of this forest luxuriance, with the darkness falling about us like a black curtain from the heavens, and the mighty cañons of the Sierra sinking away from our pathway like the openings to another world, then it was not power, but majesty; not beauty, but sublimity; not the natural, but the supernatural, which seemed above us and before us."

The *Sequoia sempervirens*, or Redwood, is a very stately tree, attaining a height of 300 feet and a circumference of seventy-five or eighty feet. It is the most valuable timber-tree of California, but is fast disappearing, being confined to the upper portion of the Coast Range, not appearing below San Luis Obispo and but sparingly below San Francisco, and disappearing entirely when felled, being replaced by other trees. Its gigantic congener does not appear on the Coast Range, but is confined to four or five counties along the western slope of the Sierras. Both of these trees belong to the cedar family. The sugar pine (*Pinus Lambertiana*) is almost the peer of the Redwood in size and commercial value. Its wood is white, straight-grained, clear and free-splitting. Its height is sometimes 300 feet, and its circumference forty-five feet. It has cones eighteen inches long and four thick; a sweetish, resinous gum exudes from the harder portion of the wood, tasting much like manna, and having cathartic properties. There are fifteen other species of pine, of which the finest are the *Pinus ponderosa*, or yellow pine, 225 feet high,

Pinus Sabiniana, Sabine's or nut pine, which has an edible cone or nut, much valued by the Indians, and *Pinus insignis*, or Monterey pine. This and the yellow pine are similar to our yellow and pitch pines at the East, and are in demand for flooring purposes. The other species of pines rise from 30 to 100 feet in height, but are not so much prized. There are six species of true fir, one of them, *Abies Douglasii*, Douglas's spruce, being 300 feet in height, and three of the others, stately trees, 100 feet or more in height; the western balsam fir, *Picea grandis*, grows to the height of 150 feet.

The California white cedar—*Libocedrus decurrens*—grows to the height of 140 or 150 feet. There are also four species of cypress, three of juniper, two of arbor-vitæ, and one of yew—*Taxus brevifolia*—which attains the height of seventy-five feet. The wild nutmeg—*Torreya Californica*—the California laurel—*Oreodaphne Californica*—the madrona—*Arbutus Menziesii*—and the manzanita—*Arctostaphylos glauca*—are all beautiful evergreens. There are twelve species of oak, two of them evergreen or live oaks, the rest deciduous. The burr oak—*Quercus macrocarpa*?—is the largest of these, but its wood, like most of the others, is principally valuable for fuel. The *Quercus Garryana*, sometimes called white oak, though not a large tree, has a dense, fine-grained wood, used for making agricultural implements. There is one of the chestnut family, the Western chinquapin, a fine tree, sometimes attaining a height of 125 feet. There are four acacias, thorny enough; three poplars, or cottonwoods, one very large; two alders; the Mexican sycamore; one species of walnut—*Juglans rupestris*—a fine tree; three species of dogwood or Cornel, all differing from the Eastern dogwoods; four wild lilacs; two wild cherries, both shrubs; two maples—*Acer macrophyllum*—a large and beautiful tree—and *Acer circinatum*—the vine maple, a smaller tree, found only in the mountains. There are three yuccas, two species of willow, a box elder, an Oregon ash, and the flowering ash, which is not a true ash, one species of buckeye, one of ironwood, a *Parkinsonia* or greenwood, small but elegant; two or more species of cactus, a native persimmon, and the valuable Japanese species; the pis-

tachio-nut and many species of semi-tropical trees which are unknown elsewhere. The shrubs and small fruits are numerous, but the cultivation of these and of grapes and edible nuts and berries belongs rather to horticulture. There are many medicinal plants and shrubs, some of them possessing very valuable qualities. Grasses are very numerous, and some of them highly nutritious, but they are nearly all annuals, and except in the foggy regions along the northwestern coast, there are hardly any native grasses which will make a sod or which are adapted for hay. The greater part of the State is entirely destitute of anything like a permanent sod, and aside from the wild oat (*Avena sativa*), the wild barley (*Hordeum jubatum*), the burr clover (*Medicago denticulata*) and four or five species of native clovers, which are annuals, and are cured by the sun at the beginning of the dry season, but form for a time good pasturage, the farmer and stock-raiser is compelled to rely on Alfalfa and the forage grasses and cereals, Hungarian, German, and pearl millet, Egyptian rice-corn or Dhurra, oats, wheat, rye, sorghum as a forage plant, etc., for late feeding of his stock.

Wild flowers abound in California, many of them those highly prized by florists elsewhere, of remarkable beauty of form and color, and some of them exceedingly fragrant. The lily and syringa families, many of them shrubs and even trees, and conspicuous alike for beauty and fragranc y, are found growing wild and filling the air for long distances with their perfume. Of cryptogamous plants, the quantity and variety is almost without limit. One hundred species of mosses have been described, and the mushrooms, seaweeds, lichens and fungi are still more abundant.

Zoölogy.—There are 115 species of mammalia in California, of which twenty-seven are carnivorous, including the grizzly, black, and brown or Mexican bear, the raccoon, badger, two species of skunk, the wolverine fisher, American sable or marten, mink, yellow-cheeked weasel, California otter and sea otter, the cougar, jaguar, wild cat, red lynx and banded lynx, raccoon fox or mountain cat, gray wolf, coyote or barking wolf (this differs somewhat from the prairie wolf, and is becoming annoy-

ingly abundant in the State, preying upon lambs, young pigs, fowls, etc.), five species of fox, three or four species of sea-lion, two species of seal, and the sea-elephant. The larger and more formidable of these carnivora are becoming rare in the State except in some of the more sparsely inhabited counties; the grizzly and other bears are found in the mountains, but the *felidæ*, especially the cougar, jaguar, and the lynxes are rare, and the gray wolf is not often found near the settlements.

Of the insect eaters, there are two moles, two shrews, and sixteen species of bats. Of the rodents, there are the beaver, the sewellel or mammoth mole, five species of ground-squirrels, pests which multiply by the million and levy their assessments upon the grain crop, often carrying off half the crop and riddling the stacks and sacks of grain, and even finding their way into the barns and storehouses. There are also five species of tree-squirrels, more harmless in their character. Of the mouse family there are eighteen species, including three naturalized ones. The musk-rat, jumping mouse, four species of kangaroo mice, and five of gophers, a pest almost as destructive of trees, shrubs, and plants as the squirrel is of the grain. There is a yellow-haired porcupine, six species of hares and rabbits, some of them peculiar to the Pacific coast, and a coney or rat-rabbit. Of ruminants, there are the elk, the white-tailed, black-tailed, and mule-deer, the American antelope, the mountain goat or goat-antelope, and the big-horn or mountain sheep.

Of the cetacea, as well as of the sea-fishes, California claims justly all that are found in the waters of the Pacific within the bounds of the United States, possibly excluding Alaska. This includes the right and the California gray whale, the hump-back and fin-back, two of the beaked whales, the sperm whale, the black fish and three species of porpoise.

Of birds there are 350 species or more, recognized as natives of California. There are twenty species of climbers, fifteen of them wood-peckers; of birds of prey there are thirty-seven species, including five of the eagle family, ten species of buzzard-hawks, four hawks and four falcons; twelve species of owls; the king of the vultures, and the turkey-buzzard, or turkey-vulture.

There are eleven species of perchers in the first group, including the crows, ravens, magpies, jays, and king-fishers; 148 species in the second and third groups, the insectivorous and granivorous perchers, including the fly-catchers, humming-birds, swallows, wax-wings, shrikes, tanagers, robins and thrushes, wrens, chickadees, grosbeaks, finches, linnets, larks, orioles, and sparrows. There are but three species of pigeons, the band-tailed pigeon, and the turtle and ground-doves. Of grouse there are the blue grouse, sage-cock, prairie-hen, and ruffed grouse, and three new species of quail. The waders are numerous, fifty-one species having been described. These include cranes, herons, bitterns, ibises, plover, kill-deer, avocets, snipes, sandpipers, curlews, rails and coots. Of swimmers over ninety species have been described, including many species of geese, brant, teal, ducks, scooters, coots, sheldrakes, mergansers, pelicans, cormorants, albatrosses, fulmars, petrels, gulls, terns, loons, dippers, auks, sea-pigeons and murrés.

Of the fishes, about 240 species have been discovered in the lakes, bays, rivers, and on the sea-coast of California, of which more than 200 are edible. These include nine species of the salmon family, four of the cod family, a dozen eels, seven or eight species of mackerel; numerous species of the perch family and the allied genera; two tautogs, viz., the red-fish and the kelp-fish; fifteen flat fish and flounders; nine species of shad, herring and anchovies, two of them introduced from the East; twenty-two carps, and thirty-five species of cartilaginous fishes, sturgeons, sharks, rays, sun-fish, etc., etc.

There are sixty species of mollusks, including a great variety of clams, oysters, mussels, scollops, whelks, limpets, sea-snails, cuttle-fish, squids, nautilus, etc., etc. Of crustaceans there are eight or ten species, including crabs, king-crabs, lobsters, shrimps and craw-fish. Of the reptiles there are great numbers, though there are no true saurians (alligators or crocodiles), except in the Colorado river on the southeast border of the State. There are three species of tortoise, possibly some terrapins, thirty-one lizards, five rattle-snakes, twenty-five species of harmless snakes, twenty-three frogs, several toads, horned toads, salamanders, etc.

Objects of Interest and Wonder.—First among these is the far-famed valley of the Yosemite, known everywhere as one of the wonders of the world. The best and most accurate and satisfactory description of this wonderful valley ever written is that from the pen of Josiah D. Whitney, LL. D., State Geologist of California, and a member of the National Academy of Science. This description, slightly condensed, we give below :

“The word *Yosemite* means ‘a full-grown grizzly bear,’ and was not the aboriginal name of the valley itself, but that of a noted chief of the tribe inhabiting it. The present Indian name of the Yosemite is said to be *Ah-wah-nee*.

“The Yosemite valley is situated in the Sierra Nevada of California, about 150 miles in a direct line a little south of east from San Francisco, nearly in the centre of the State of California, north and south, and about midway between the east and west bases of the Sierra, which is here not far from seventy miles in width. It is a level area, about six miles in length, and from half a mile to a mile in width, and is sunk nearly a mile in depth below the general level of the adjacent region. It has very much the character of a gorge or trough, hollowed in the mountains in a direction nearly at right angles to their general trend. This gorge has not a regular form, but while its general direction remains nearly the same, its sides advance and retreat, with angular projections and recesses, thus giving a great variety of outline to the enclosing masses. The river Merced, which rises in the Sierra, some fifteen miles higher up than the head of the valley, in the group of mountains of which Mount Lyell is the dominating peak, runs through the Yosemite with many graceful windings, and gives rise at the head of the valley to the remarkable waterfalls, which will be noticed farther on. Two branches of the main Merced also enter the valley near its head ; one, the Tenaya Fork, which rises in a beautiful mountain lake of the same name, comes in from the northeast ; the other, the Illilouette, enters from the south. These tributaries join the Merced through deep cañons, as the mountain gorges in the Sierra are always called ; but there are several other smaller streams which also enter the valley, leaping over its walls, and giving rise in

almost every instance, to interesting falls; which, however, are not in general of any great size, except during the early part of the season, when the snow upon the adjacent mountains is melting.

“The pleasure-seeking traveller, who visits the Yosemite, does not confine his explorations to the valley proper, but from various commanding points adjacent to it obtains a great variety of views of the groups of peaks which form the crest of the Sierra in that region, as well as of the spurs which extend down from the main range, or stretch along parallel with it. Thus a journey to the Yosemite properly includes a tour around its exterior, or at least one or more visits to prominent points of view above it, from which the observer cannot only look directly down into the depths of the valley below him, but also command a variety of views of lofty and in part snow-clad ranges, which offer among themselves most remarkable contrasts of form and structure.

“In noticing the details of the scenery of the Yosemite, the valley proper may first be considered. The prominent features here are: the great elevation of the walls which enclose it; the remarkable approach to verticality in these walls; their great height and their wonderful variety and beauty of form. To these features may also be added the attractions of the magnificent waterfalls which occur at various points on both sides of the valley, although these, as already noticed, must be seen early in the season in order that the traveller may be greatly impressed by them. In entering the Yosemite by the roads which approach it from the lower end, the visitor notices that he has before him a valley of a different type of form from those he has before been accustomed to see. He passes from a V-shaped gorge or cañon into one which may be fairly called U-shaped, since its walls rise almost vertically from its floor. This change of form is strikingly impressed on the visitor as he approaches what may be called the gateway of the Yosemite. Here he sees before him, on the north side of the valley, the mass of rock called El Capitan, and exactly opposite the Bridal Veil and Cathedral Rocks. At this point the distance across the valley is only a mile, measured from the summit of the Bridal Veil Rock

to that of El Capitan, and at the base of these cliffs there is only just room for the river to pass. El Capitan is an immense block of granite projecting squarely out into the valley, and presenting two almost vertical faces, which meet in a sharp edge 3,300 feet in perpendicular elevation. The sides or walls of this mass are bare, smooth and entirely destitute of vegetation. It is doubtful if anywhere in the world there is presented so squarely cut, so lofty and so imposing a face of rock. On the opposite side of the valley is the grand mass of the Cathedral Rocks, divided into two parts by a deep notch between them. The most striking face of the larger Cathedral Rock is turned up the valley, but on the side facing the entrance there is a feature of great beauty, namely, the Bridal Veil Falls, made by the creek of the same name, which, as it enters the valley, descends in a vertical sheet of 630 feet perpendicular, striking there a pile of *débris*, down which it rushes in a series of cascades, with a vertical descent of nearly 300 feet more, the total height of the fall being 900 feet. This creek flows through the entire year, but the fall is only great when the amount of water is near its maximum. When the stream is neither too full nor too low, the mass of water, in its fall, vibrates with the varying pressure of the wind blowing in the daytime up the valley in the most beautiful and remarkable manner. It is this fluttering and waving of the sheet of water which has given it the poetic but somewhat fanciful name it now bears, that of the Indians having been *Pohono*, a term having reference, it is said, to the chilliness of the air under the high cliff and near the falling waters. There is also a charming fall in a deep square recess of the rocks opposite the Bridal Veil, and just below El Capitan. This fall, which is over 1,000 feet high, is called the Virgin's Tears. It runs, however, but a short time during the early summer months.

“Passing up the valley after entering between the Cathedral Rocks and El Capitan, the level area or river-bottom increases to nearly half a mile in width. This area is broken up into small meadows, gay with flowers in the early summer, and sandier regions on which grow numerous pitch-pines, and some oaks, cedars and firs. The walls of the valley continue lofty and

broken into the most picturesque forms. Of these the Three Brothers and the Sentinel Rock are the most conspicuous. Nearly opposite the Sentinel Rock is one of the most attractive features of the Yosemite, namely, the fall made by the descent of Yosemite creek down the wall on the north side of the valley. The vertical elevation of the edge of this fall is 2,600 feet, but the descent is not in one unbroken sheet. There is first a vertical fall of 1,500 feet, then a descent of 626 feet in a series of cascades, and finally one plunge of 400 feet on to a low talus of rocks at the foot of the precipice. The body of water is not large, and it decreases considerably as the season advances, becoming very small, in ordinary years, by the end of August. The width of the stream in June and July is usually about twenty feet, and its depth about two feet. The beauty and grandeur of this fall, however, taken in connection with the majesty of its surroundings, give it a claim to be ranked among the most remarkable natural objects in the world. There are certainly very few waterfalls which can compete with it.

“At the head of the valley the falls of the Merced river are of great interest. There are two of them with beautiful intervening rapids. The lower one is called the Vernal Fall, and is about 400 feet in vertical height. The upper, the Nevada Fall, is about 600 feet in elevation. The body of water in these falls is large, and the effect very grand. As the Merced river is fed by melting snows high up in the Sierra, the amount of water is not so much diminished toward the end of the season as it is in the case of the smaller creeks heading at an inferior elevation; thus the falls of the Merced usually remain extremely picturesque and attractive objects during the whole summer.

“The dome-shaped masses of granite which characterize the vicinity of the Yosemite are also extremely grand. The North Dome, on the north side of the valley, lends itself to beautiful combinations of scenery, as seen from various points a little above the Yosemite Falls. The Sentinel Dome, on the opposite side, is not visible from the valley itself, but it affords a magnificent view from its summit of the valley and its surroundings, and especially of the high Sierras. A projecting cliff called

Glacier Point, a little lower than this, and just on the edge of the valley, is also much visited for the sake of the grand view which it offers of the whole region, but especially on account of its favorable situation with reference to the Half-Dome, of which it commands a most wonderful view. The rock thus named is the highest point in the immediate vicinity of the Yosemite, rising to an elevation of 4,737 feet above the general level of the valley. The Half-Dome has the appearance of having been originally a dome-shaped mass which has been split into two parts, one of which has sunk down and disappeared; hence the name. It fronts the Valley of the Tenaya fork of the Merced with a very steep slope, crowned by a vertical wall of fully 1,600 feet in elevation, forming together a mass of rock of the most astonishing form and imposing magnitude. Arrangements are now made by which this Half-Dome, or, as it is now called, the South Dome, may itself be ascended. It is a weary climb, possible only by the aid of a rope of great strength fastened to the rock by iron staples every fifteen feet, by which the climber works his way, hand over hand, for about 1,500 feet; but the view at the top is grand and beautiful. Still more magnificent is the view from Cloud's Rest, fourteen miles away by the trail, and a most fatiguing journey, but once reached, the traveller feels that he has seen 'all the kingdoms of the world and the glory of them.'

"The rocky citadel juts out into space, so that you seem isolated from the world, and held pendant over the valley. Around you is an unbroken horizon of mountain peaks, with the great valley in the centre, its walls dwarfed to pigmy proportions. The lesser mountains and barren rolling ridges resemble nothing so much as a storm-tossed ocean turned to stone. A more absolute desolation could not be conceived. You feel the weight of the centuries that look down upon you from the lonesome peaks of the Sierras. The spectacle reminds one strongly of maps of the moon; it gives the same impression of lifeless repose after giant upheavals of mountains and rending of rock-buttressed walls. Thomas Hill, the artist, says that he once took a seven days' camping excursion about the

valley, with a nephew of the present Czar of Russia. At all the other peaks the Prince found some mountain in the Alps or the Himalayas the view from which surpassed the one before him. But when the summit of Cloud's Rest was reached, he took off his hat and said: 'I salute the grandest view in the world.'"

The Yosemite valley was given by Congress to the State of California in 1864 to be "held for public use, resort, and recreation," to be also "inalienable for all time" with the condition that portions of the valley might be leased, the income arising from such leases to be expended "in the preservation of the property or the roads leading thereto." The grant is managed by commissioners appointed by the governor of the State. Wagon roads, railroads and trails have been built to afford more convenient access to the valley, and to various points commanding remarkable views of the valley and its surroundings.

The Tuolumne river, another tributary of the San Joaquin, which enters it a few miles north of the Merced and drains Tuolumne county as the Merced does Mariposa, also has its sources in the Sierra Nevada, and about fifty miles northwest of the Yosemite valley, flows through another valley nearly or quite as picturesque and grand as the Yosemite and with as many and as lofty waterfalls.

But these remarkable valleys do not furnish all the natural wonders of California. In Tulare, Fresno, Mariposa, Tuolumne, and Calaveras counties there are groves of the gigantic Sequoias, whose vast height and wondrous beauty would well repay a journey across the continent.

In Napa county, near Calistoga, is a narrow valley where are all the evidences of recent, and, indeed, existing volcanic action. The whole valley or cañon is filled with flowing (not spouting) hot springs, which are called geysers (an inappropriate name, though they are very singular in their action, flowing with intermissions), and the whole soil is covered with a crust of sulphur, iron-rust, and other mineral deposits, and filled with steam from the boiling water. The ground shakes under the foot-steps, and is so hot as to be uncomfortable to the feet.

Besides these there are the natural bridges and the chiyote

caves of Calaveras county, with their bell-sounding rocks, the magnificent grotto near Grizzly Flat, in El Dorado county; of the lakes, Tahoe, the gem of the mountains, almost at the summit of the Sierras, and the smaller but romantic Lake Donner on the boundary line of Nevada; Mono (salt) lake, in Mono county, not far from Yosemite; Klamath lake, in the north; Tulare lake in the county of the same name; and the wild volcanic region in the southeast in Inyo, Mono, San Bernardino, and Kern counties; that region of horrors enclosing the sink of the Amargoza river, the "Death Valley," of which we have already spoken, 400 feet below the level of the sea, while within sight of it the Sierras tower 14,000 or 15,000 feet above the sea. This deep depression, forty miles long and eight or ten wide, is partly crusted over with salt and soda and other alkalis several inches thick, and partly composed of an ash-like earth mixed with a tenacious clay, sand, and alkali so soft that no animal can cross it without being mired. There is no vegetation on any part of it, and the temperature during at least six months of the year ranges from 110° to 140° Fahrenheit.

Climates.—Prof. E. W. Hilgard thus describes the various climates of the State:

"Taking as a convenient point of view the central portion of the State, the climates of California may be roughly classified as follows:

"1. *The bay and coast climate.* Its prominent characteristics are, first, the small range of the thermometer, caused by the tempering influence of the sea, the prevailing winds being from the west. The average winter and summer temperature at San Francisco thus differs by only about 6° Fahrenheit (53° and 59° respectively). Snow rarely reaches the level of the sea, and is sometimes not seen for several seasons, even on the summits of the Coast Range.* A few light frosts with the thermometer at between 28° and 32° Fahrenheit for a few hours during the

* The winter of 1880 was one of the exceptional years in which snow *did* reach the coast, and the thermometer marked 18° Fahrenheit. This severe weather was very destructive to flowering plants and shrubs, but was said not to have occurred for more than thirty years previously. Ordinarily, the fuchsia and heliotrope live and thrive in the open air there in winter.

night is the ordinary expectation for winter, while in summer the number of 'hot' days on which the thermometer reaches 80° or more, rarely exceeds eight or ten. These occur chiefly in September and under the influence of the 'norther,' which causes the hot dry air of the interior valleys to overflow the barrier of the Coast Range. Under a brilliantly clear sky, it sweeps over the mountains, accompanied by clouds of dust, and, like the hot breath of a furnace, it licks up all moisture before it, wilting and withering the leaves of all but the most hardy plants, cracking and baking the soil, loosening the joints of all wooden structures, whether wagons, furniture, or houses, and causing the latter to resound at night with the splitting of panels and similar unearthly noises, to the discomfort of the nervous sleepers, that at such times comprise the vast majority of the population. This universal infliction fortunately lasts but rarely more than three days, when the welcome sea-fog, which has been kept standing like a wall forty or fifty miles in the offing, gradually advances, and with its grateful coolness and moisture infuses fresh life into the parched vegetation and the irritable, panting population.

"During the winter months the north wind is equally dry, but at the same time cold; and while it then sometimes lasts a week or more, it causes but little discomfort or damage, save occasionally to the young grass and grain. The second distinctive feature of the coast climate is the fogs brought in from the sea by the prevailing west winds or summer trades, as the result of their crossing the cold Alaskan current in-shore. The sea-fogs, coming in regularly almost every afternoon from the latter part of June to that of August, and more or less throughout the year, often with a gorgeous display of cloud pictures, temper materially not only the heat, but also the summer drought; so that under their influence plants requiring but a moderate degree of moisture can, in a loose soil, grow throughout that season. In the latitude of San Francisco it thus happens that in the coast climate sub-tropical and northern plants may thrive side by side; the latter (such as currants and cranberries) ripening with ease and in great perfection, while the fig, grape, orange, etc., though growing luxuriantly, can ripen their fruit only in valleys pro-

tected by mountain ridges from the direct influence of the summer trade-winds. Thus while a broad river of fog may be pouring in at the Golden Gate, covering the two cities and spreading out on the opposite shore to a width of eight or ten miles, the hamlet of San Rafael, only fourteen miles to the north, but under the lee of Mount Tamalpais, and the old town of San José, under the protection of its seaward mountains, forty miles to the south, are mostly basking in full sunshine, and ripen to great perfection not only the grape, but also the more tender fruits of their groves of fig and orange.

2. *Climate of the great interior valley.* "The average winter temperature is lower than that of corresponding portions of the coast, although the *minimum* is little, if at all, below that of the latter. Sub-tropical plants, therefore, winter there almost as readily as on the coast. In summer, however, the average temperature is high, often remaining above 100° Fahrenheit for many days, the nights also being very warm. At the same time, however, the air is so dry as to render the heat much less oppressive than is the case east of the mountains, sunstroke being almost unknown. Standing on the summits of the Coast Range in summer, and looking down upon the thick shroud of fog covering all to seaward, the white masses can be seen drifting against the mountain side, and, rising upward, dissolving into thin air as soon as, on passing the divide, they meet the warmth of the Great Valley. From points in the latter the cloud-banks may be seen filling the mountain passes and sometimes pouring like a cataract over the summit ridges, but powerless to disturb even for a moment the serenity of the summer sky, or to yield a drop of moisture to the parched soil of the San Joaquin plains. The unwary traveller, starting from Sacramento or Stockton on a hot summer's day without the thought of shawl or overcoat, may find himself chilled to the bone on crossing the Coast Range, and runs imminent risk of rheumatism or pneumonia. On the other hand, the San Franciscan, feeling the need of having his pores opened by a good perspiration, can have his wish gratified in an hour or two by taking the reverse direction. The 'nother' is, of course, more frequent in the great valley

than on the coast; but its dryness and high temperature are not so much of a change from the ordinary condition of things, and it therefore does not cause such general remark, disturbance, or damage unless unusually severe.

3. *Climate of the slope of the Sierra Nevada.* "The essential features of the climate of the Great Valley may be roughly said to extend to the height of about 2,000 feet up its flanks into the 'foot-hills,' with, however, an increasing rainfall as we ascend, and therefore greater safety for crops and less absolute dependence upon irrigation. Higher up, the influence of elevation makes itself felt; snow falls and lies in winter, while the summers are cool; and we thus return to the familiar *régime* of seasons as understood in the Middle and Northern States, including, especially in the more northern portion, the phenomenon of summer thunder-storms, which are almost unknown on the coast and in the San Joaquin valley. The same general features come into play more and more as we advance northward in the hilly and mountainous regions lying north of San Francisco bay, toward the Oregon line, marked also in general by a gradual increase of timber growth. The features of the three principal climates described intermingle, or are interspersed, according as the valleys are open to seaward, run parallel to the coast, or are in communication with the great interior valley. We thus find numberless local climates, 'thermal belts,' and privileged nooks adapted to special cultures which may be impracticable in an adjoining valley, and almost insular as regards the region where similar conditions are predominant. To the southward, the chief climates above defined are modified by three factors, viz.: the increase of temperature, the decrease of rainfall, and the decrease, from about San Francisco southward, of the feature of summer fogs. As regards temperature, the extreme range is still very nearly the same at Los Angeles as at San Francisco; but the averages are very considerably higher at the former point, that of the winter being 60°, that of summer about 75° Fahrenheit. At intermediate points along the coast, local variations excepted, the averages vary as sensibly as the latitude. As to rainfall along the coast, its decrease is slow, descending

from twenty-four inches at San Francisco to fifteen at Santa Barbara, twelve at Los Angeles, and nine to ten at San Diego. But in the interior valley the decrease is much more rapid, as previously stated, modified locally, according as the divide of the Coast Range is so high as to preclude the access of moisture from the sea, or low enough to admit its influence. The same factor influences also the cooling and moistening effect of the summer winds and fogs, which temper the summer climate of the Los Angeles plain, but fail to reach the Mojave desert or the fervid plains of the upper San Joaquin valley."

We supplement this general statement by the following table, corrected to the latest date. It is the average in most cases of twenty years:

Places.	Mean temperature. Spring.	Mean temperature. Summer.	Mean temperature. Autumn.	Mean temperature. Winter.	Mean temperature. Year.	Rainfall. December to May.	Rainfall. June to November.	Rainfall. Year.
San Francisco . .	56.3°	59.5°	58.8°	51.9°	56.6°	24.97	2.31	27.28
Sacramento . .	58.5°	71.5°	62.1°	47.9°	59.9°	19.80	1.70	21.50
Humboldt Bay . .	52.0°	57.5°	53.0°	43.5°	51.5°	. . .	. . .	57.24
Benicia	56.5°	67.0°	60.5°	49.0°	58.0°	. . .	. . .	22.86
Monterey	54.0°	59.0°	57.0°	51.0°	55.5°	. . .	. . .	12.20
Visalia	60.6°	79.5°	60.9°	48.6°	62.4°	9.96	0.53	10.49
San Diego	59.4°	69.1°	63.8°	54.1°	61.6°	11.70	.80	12.50
Los Angeles . . .	58.6°	68.6°	65.1°	54.3°	61.7°	19.88	1.38	21.26
Fort Yuma . . .	72.0°	90.0°	75.5°	57.0°	73.5°	1.89	.73	2.62

In 1878, the maximum temperature was reached in San Francisco, September 15th to 18th, when the thermometer stood at 86°, 90°, 92° and 93° Fahrenheit. In no other days of the year, except one in October, did it reach 80°. The lowest point was reached on the 4th of January and was 39° Fahrenheit. There were no frosts during the year. The extreme range of the year was 54°.

In Sacramento the highest point reached was 103°; for three days the thermometer rose above 100°; for twenty-three days it exceeded 95°, and for sixty-three days it was above 90°. The lowest point was reached January 3d. It was 27°. For six days there were frosts. The extreme range was 76°.

In San Diego the thermometer indicated 91° on the first of

September, but did not reach 90° on any other day. It exceeded 80° only eleven days of the year. The minimum was for three days in January, 38° . The range was 53° .

Visalia (latitude $36^{\circ} 20'$, west longitude from Greenwich 119.16) reached 106.5° , July 14th. During twenty-three days the temperature exceeded 100° , and for sixty-nine days it exceeded 95° . The minimum, January 4th, was 24° . There were eight days of frost. The range was 82.5° .

Los Angeles (latitude $34^{\circ} 3'$, west longitude from Greenwich 118.16) reached 93° on the 20th of July and the 1st of September. Seven days exceeded 90° . The minimum was 36.5° on the 31st of December. There were no frosts. The range was 56.5° .

Fort Yuma (latitude $32^{\circ} 43'$, west longitude 114° 36') reached 113° , July 19th; four days were above 112° ; eleven days above 110° ; fifty-three above 105° , and one hundred and six above 100° . In other years the maximum had been as high as 126° . The minimum, December 31st and January 3d, was 33° . Range 80° .

California, as the gateway of the Pacific, holds a different position to "Our Western Empire" from any other State or Territory in it. With its fine climate, its vast extent of fertile soil, its rich and abundant pasturage, its great mineral wealth, its extensive commerce, and its growing manufactures, it has a career before it much like that of the State of New York on the Atlantic coast.

CHAPTER IV.

COLORADO.

COLORADO, often called "the Centennial State," because it was admitted to the Union in 1876, the year of our Centennial celebration of our national existence, is situated very nearly in the centre of "Our Western Empire," the distance in a direct

line being about the same to St. Louis and to San Francisco—to the frontier of British America and to that of Mexico. It lies between the thirty-seventh and the forty-first parallels of north latitude, and between the 102d and the 109th meridians of longitude west from Greenwich. Its width from north to south is about 280 miles, and its length from east to west about 370 miles. Its area is 104,500 square miles, or 66,880,000 acres.

The great plains which stretch from the Missouri river to the foot-hills of the Rocky Mountains, rising slowly but steadily with each mile of their advance westward, have attained, when they reach the mountains, an elevation of between 6,000 and 7,000 feet above the sea. Eastern Colorado, for about three-sevenths of its extent, from east to west, consists of the most elevated part of these plains, which reach as far as Denver. West of the 105th meridian come the Rocky Mountains, which here attain their greatest breadth. The mountains consist of several principal ranges (which, however, do not extend continuously from north to south, but are broken off and made irregular by the great parks which are a feature of the mountains in Colorado), and of numerous spurs or short ranges extending westward, southwestward and northwestward, and terminating usually in broad plateaux, which are suddenly broken off by the deep cañons of the Green, Grand, and other tributaries of the Colorado of the West. It is a feature of the Rocky Mountains, and perhaps of all mountain chains on this continent, that the eastern slope of each range is generally much more gradual than the western, and that the ascent, even of its highest summits, is less difficult on the eastern than the western face. The western slope of each range is generally precipitous and sometimes impracticable. The ranges in their order, beginning with the easternmost, are the Colorado Front Range, which, though adopting some local names in the southern part of its course, extends from the northern to the southern bounds of the State. It has several lofty peaks, among which are Mount Evans, Mount Rosalia, Pike's Peak, and Chief Mountain. The first three are over 14,000 feet in height. The next in order is the Northern Colorado or Main Range, which joins the Front Range at the northern face of the

South Park. It has three summits above 14,000 feet, and three above 13,000; the first three are Gray's Peak, Irwin's Peak, and Long's Peak; the second three, Arapahoe Peak, Mount Guyot, and James Peak. Bald Mountain, in Gilpin county, 10,322 feet, is also in this range. The Park Range, between which and the preceding are situated the three great parks, North, Middle and South, extends from the northern border of the State nearly to the Arkansas river, in latitude $38^{\circ} 40'$. This range has six summits of 14,000 feet or above, viz.: Buckskin Mountain, Mount Cameron, Horseshoe Mountain, Mount Lincoln, Quandary Peak, Silverheels, and Sheep Mountain, 12,589 feet.

The Sawatch or Saguache Range, which is reckoned a part of the Main Range, begins at the Grand river and extends south as far as the Saguache river, where it sends out a spur to the southwest, known as the Cochetopa Hills—has ten summits, all but one of them over 14,000 feet; these are: Mount Antero, Mount Elbert, Mount Harvard, Holy Cross Mountain, La Plata, Massive Mountain, Mount Princeton, Shavano and Mount Yale, while Mount Grizzly is 13,956 feet in height.

Between the Saguache and the Park ranges is interposed, in Southern Colorado, the Sangre de Christo Range, which has four summits over 14,000 feet; one of them, Blanca Peak, the highest in Colorado, and the highest, except one, in the whole West. Besides Blanca, Baldy Peak, Culebra and Hunt's Peak are above 14,000 feet, and the two Spanish Peaks are 13,620 and 12,720 feet respectively.

In Southwestern Colorado there is a confused group of mountains, consisting of the main or dividing range and numerous spurs, known as the Uncompahgre Mountains, San Miguel Mountains, Dolores, La Plata, etc. There are thirteen principal peaks in this group, eleven of them over 14,000 feet, several of which are within a few feet of the altitude of Blanca Peak. These summits are, Mount Æolus, Handie's Peak, Pyramid, Pidgeon's San Luis Peak, Simpson's, Mount Sneffles, Stewart's Peak, Uncompahgre, Wetterhorn, Mount Wilson, and the two lower summits, Blaine's Peak, 13,905, and Engineer Mountain, 13,076 feet. On the west, these mountains terminate in broad

and elevated plateaux and *mesas*, which extend to the river banks and there are riven by the deep cañons of the affluents of the Colorado. Among these plateaux are the Grand Mesa, north of Gunnison river, the Uncompahgre Plateau, between the Gunnison and the Dolores, and extending to the Grand river; the Dolores Plateau, between the Dolores and the San Miguel river, and the Southwest Plateau, between the Dolores and the Rio Mancos, and extending to the San Juan river.

In Western Colorado, in what is known as the Gunnison country, there is another mass of mountains, probably spurs from the Saguache or Sawatch range, which trend northwestward, westward and southwestward. There are many summits in this group which is known as the Elk Mountains; more than twenty being visible from the summit of Castle Peak, but only four rise to 14,000 feet, and one, Teocalli, is but 13,113.

Besides those which we have named, there are several hundred peaks in the State ranging from 10,000 to 12,000 feet above the sea, which would be noticeable in any other State, but rising from elevated table-lands 6,000 to 8,000 feet above the sea, they seem much less lofty than they otherwise would. Of the twenty most famous passes over the Rocky Mountains in this State only two are below 9,000 feet, and only five, of which the noted Veta Pass is one, are below 10,000, while five are above 12,000 feet, and one, the Argentine, is 13,100 feet above the sea, and is only practicable in summer.

Of the great numbers of lakes scattered in the mountain valleys, only one group, the San Luis lakes, situated in the beautiful San Luis Park, are below 8,000 feet in altitude, while the Green Lakes are 10,000 feet, and the Chicago Lakes 11,500 feet above the sea.

Of seventy-three important towns or locations in Colorado, only twelve are below 5,000 feet, and ten are above 10,000 feet, the Present Help Mine on Mount Lincoln being 14,000 feet.

"The parks of Colorado are a distinct and remarkable feature of this mountain system. They are generally composed of level or rolling lands, covered with luxuriant grasses, and dotted here and there with groves of timber. They are walled about with

mountains grand and high, and are watered by streams of the purest character." *

The North, Middle, and South Parks, and the San Luis Park form an almost continuous belt across the State from north to south, varying in width from thirty to fifty miles, and only separated from each other by mountain chains. The North Park has a diameter of about thirty miles, an area of somewhat less than 1,000 square miles, or over 600,000 acres, and an average elevation of about 9,000 feet. The Middle is much larger, having a length of sixty-five miles by a breadth of forty-five miles, an area of about 2,800 square miles, or 1,900,000 acres, and an altitude of about 8,000. The South Park is closed in by mountains on all sides, except the east; its elevation is nearly 9,000 feet, its area about 1,200,000 acres. The San Luis is lower (about 7,000 feet above the sea), but as large as all the rest, having an area of about 4,000,000 acres. The North Park is drained by the north fork of the Platte; the Middle by tributaries of the Grand river; the South by affluents of the South Platte, and the San Luis by the Rio Grande del Norte, and its tributaries, and by streams flowing into the San Luis lakes.

Egeria, Estes, Animas, and Huerfano Parks are also of considerable size and of great beauty. Monument Park and the Garden of the Gods adjacent, are not so much parks as natural phenomena illustrating the erosion of the rocks. It is the opinion of geologists that these parks were ages ago the beds of vast lakes, but that by some volcanic or other cosmical convulsion they were upheaved and drained of their waters, though their relative position to the mountains was not disturbed.

The mountains of Colorado are covered with pine, fir, spruce, aspen, and other forest trees up to elevations varying from 10,800 to 12,800 feet. Above the timber line all is bleak and barren rock, varied by the occasional presence of grass and Alpine flowers.

Rivers and Streams.—Though within the meridians of longitude which a few years ago were declared to be those of the "Great American Desert" *par excellence*, it cannot be justly said

* Frank Fossett's "COLORADO."

that Colorado is not well watered. Its higher lands may require some irrigation, but the streams are there to irrigate them. On the east of the "Great Divide" the South Platte river, with about twenty tributaries on each side, rises far up among the summits of the Park Range, and pursuing a north-northeast, and then an easterly course, drains ten of the central and northeast counties; while the North Platte, taking its rise in the Rabbit Ears Range, drains the whole of the North Park. Returning to the eastern part of the State the Republican river, an affluent of the Kansas, with its four principal tributaries drains the eastern portion of Weld, Arapahoe, and Elbert counties. But the royal stream of Eastern Colorado is the Arkansas, which rises in the Saguache or Sawatch range, its sources interlacing with those of the Grand river, the largest affluent of the Colorado of the West, and in its passage downwards to the eastern boundary of the State receives more than sixty tributary streams. It is a noble river, and, in its passage through the mountain chains, cuts deep and frightful cañons almost to the base of the mountains themselves. Some of its tributaries, like the Purgatoire, Big Sandy creek, Horse creek, Apishapa, Huerfano river and *Fontaine qui Bouille*, are themselves rivers of considerable magnitude. The Rio Grande del Norte rises in the San Juan Range, where it interlaces with the sources of the Gunnison, Dolores and San Juan rivers, and flowing east-southeast receives numerous tributaries from San Juan, Hinsdale, Rio Grande, Saguache, Conejos, and Costilla counties, turns south near Alamosa and passes out of the State very nearly midway of its southern border.

The western slope of the "Great Divide" is drained wholly (except for some small streams which fall into the San Luis lakes) by the principal affluents which go to make up the Rio Colorado of the West. All of these except the main stream and some of the tributaries of the Green river have their sources in the Rocky Mountains of Colorado, and most of them either in the Park, the Saguache, the Elk or the San Juan Mountains. The tributaries of the Green river are, the Yampah or Bear river, with its branches, Elk and Elkhead creeks, Little Snake river and Vermillion creek, and the White river with its numerous

tributaries. The Grand river has its sources in the North Park, traverses with its tributaries the Middle and Egeria Parks, and by its affluents, Eagle river and Roaring Fork, distributes its waters through all the valleys of the northern Sangre de Christo Mountains and the Elk range, while its two great affluents, the Gunnison and the Rio Dolores and their numerous tributaries, the Uncompahgre, the San Miguel and Disappointment creek, drain all the western slope lying between 40° and $37^{\circ} 30'$ north latitude. In the extreme southwest the Rio San Juan and its numerous branches drain the whole of La Plata, San Juan, Hinsdale, and the western part of Conejos counties. All these rivers have scores of creeks and streams tributary to them, so that there are but few square miles in the State which are destitute of one or more living streams.

Mr. Frank Fossett, a recent able writer on Colorado, thus speaks of the cañons of these rivers:

"The river cañons, or deeply cut ravines that are found in all of the more elevated portions of Colorado, constitute a peculiar and striking feature of the great Rocky Mountain system. In the countless ages of the past, the waters of the streams have worn channels deep down into the hearts of the mountains, leaving the perpendicular granite or sandstone standing on either side for hundreds, and in some localities for thousands of feet. Nowhere are the grand and beautiful in Nature more effectually illustrated than in these mountain cañons. The glories of Boulder, Clear Creek, Cheyenne, and Platte cañons, and the Grand cañon of the Arkansas, all on the eastern slope of the Continental Divide, defy description. The walls of the Colorado, Gunnison, and Uncompahgre rivers, in the western part of the State, are still more massive and wonderful. In many sections they rise without a break or an incline to heights of thousands of feet, and along the Colorado continue in that way with hardly an outlet of any kind for hundreds of miles. The Grand cañon of the Gunnison is one of the world's wonders. Its walls on either side of the stream, and bordering it for miles, are usually not far from 300 feet in width, and are composed of stratified rock. In places these perpendicular sides, rising from

the water for distances of from one to three thousand feet, terminate in level summits surmounted by a second wall of prodigious height, thus forming a cañon within a cañon. Through the chasm between these giant formations and huge bastions and turrets one above another, dashes the river, its surface white with foam. The heights of these perpendicular cañon walls and their elevations with that of the river above sea-level at several points, are as follows: Level of the Gunnison at mouth of Mountain creek above sea-level, 7,200 feet; of top of wall or plateau on north side, 8,000 feet; height of wall, 1,600 feet; height of wall at point below on east side, 1,900 feet; on west side, 1,800 feet; height of wall in gneiss rock, 900 feet. Some distance below, the cañon wall rises directly from the river, 3,000 feet, of which the 1,800 feet nearest the water is gneiss rock; total elevation of top of wall or plateau above the sea, 9,800 feet."

Climate.—The great elevation of most of the places of residence in Colorado insures a temperate climate, rather too cool than too hot. The mean annual temperature of most of the towns, which are 5,000 feet or thereabouts above the sea, is not far from 50°—perhaps for a long term of years 48.5° to 49.3°.

The summer mean ranges from 64.6° to 69.2°, and the winter mean from 31.3° to 32.8°, so that the mean difference or range does not exceed 37° or 38°. The extremes are 93° to 99° maximum in summer, with from six to thirty days, according to the elevation, above 90°, and the minimum in winter —3° to —12° with an average of six to ten days with the mercury below zero. There is, therefore, an extreme range in the whole year of from 96° to 110°.

The rainfall averages about 18.84 inches, and is increasing. The dry and bracing character of the air at 5,000 to 6,000 feet above the sea renders the climate a desirable one for invalids with weak lungs, where the disease is not too far advanced, and thousands who have resorted thither have been temporarily, and many of them permanently benefited. Generally it is not safe for persons who are suffering from pulmonary diseases to return to the East, at least not for four or five years, however

complete may seem to be the recovery, as the return of the disease at the East is almost sure to follow even a brief visit thither. Those whose lungs are diseased should also avoid the higher elevations. An altitude exceeding 7,000 feet is dangerous, because the rarefaction of the atmosphere makes respiration more difficult, and will often bring on hemorrhage of the lungs. We give below the Signal Service reports—the average from three points, one of them the station on the summit of Pike's Peak, 14,147 feet above the sea, for the sake of comparison :

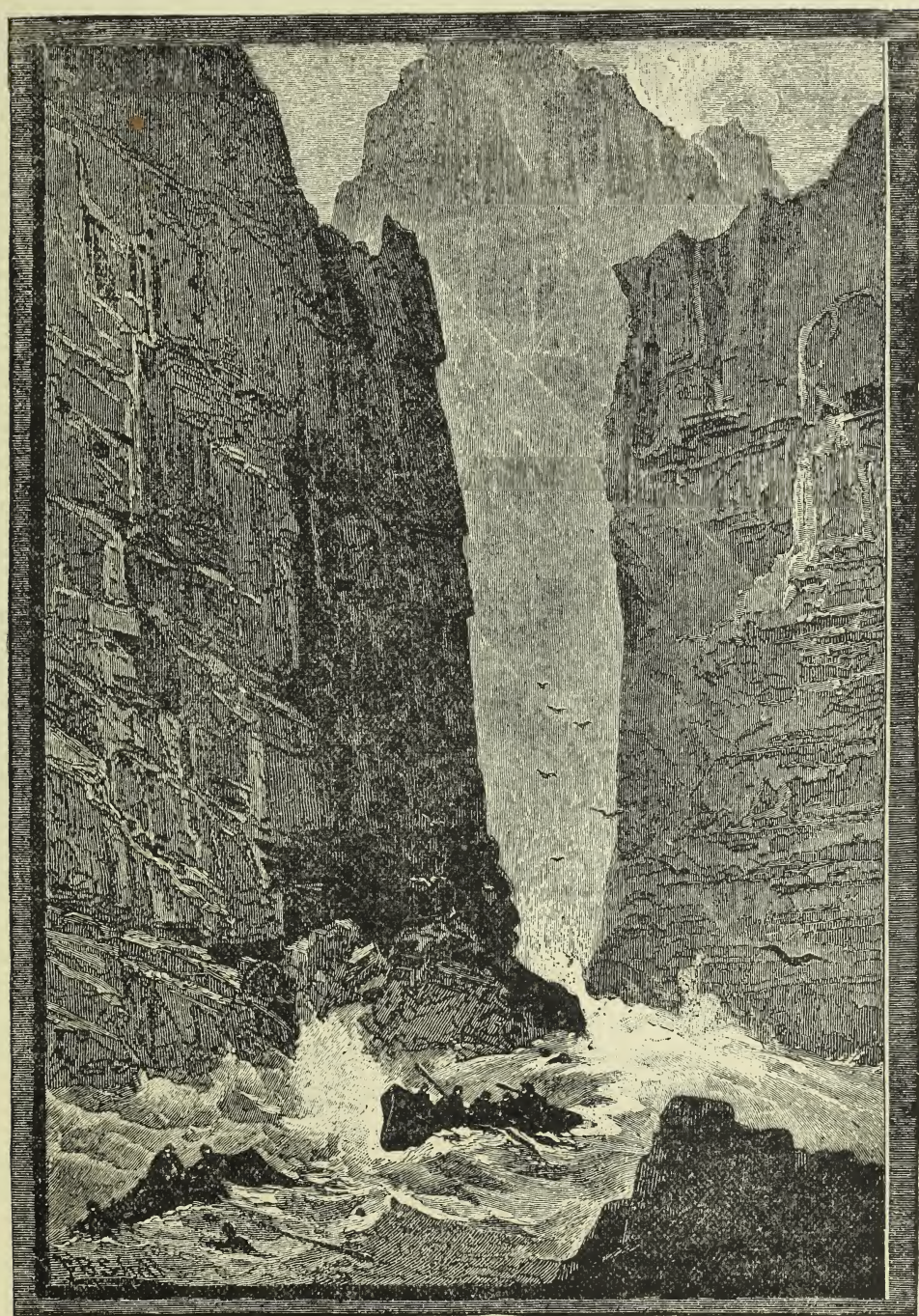
PLACES.	Elevation above the sea.	Mean annual temperature.	Mean spring temperature.	Mean summer temperature.	Mean autumn temperature.	Mean winter temperature.	Maximum temperature in summer.	Number of days thermometer above 90°.	Minimum temperature in winter.	Number of days thermometer below zero.	Range of year.	Annual rainfall. Inches.
Denver.....	5,197 ft.	49.5°	48.1°	69.2°	49.5°	31.3°	99°	32	-12°	9	111°	18.63°
Colorado Springs	6,023 ft.	47.8°	45.°	64.6°	48.8°	32.8°	93°	6	-3°	2	96.°	19.48°
Pike's Peak.....	14,147 ft	18.7°	13.6°	35.5°	20.6°	5.03°	58.2°	above 50°, 25	-23.6°	86	81.8°	27.82°

West of the mountains the snow comes earlier and lies longer and the mean temperature of winter is lower. The average elevation of the towns is higher, averaging at least 8,000 feet. These towns are so new that we have not statistics of their climate which can be depended upon.

The quantity of the snow-fall is not great except on the mountain ranges and higher elevations. In the mountain towns it begins early and lies late, blocking the trails and passes over the mountains, and requiring often a circuitous journey to reach them. The railways now building will be protected from these heavy snows generally by snow sheds. The snow never entirely disappears from altitudes of from 12,000 to 14,400 feet.

Soil and Vegetation.—Of the 104,500 square miles which constitute the area of Colorado, it is difficult to estimate very accurately what proportion should be considered as arable land, for several reasons. But a small portion, comparatively, of the State has been surveyed; only one-third in all, including the great area of pasturage, mining and timber lands. The great amount of land included in railroad grants, and the still greater quantity in Indian reservations, most of which are now in process

of extinction, the uncertainty whether land at first regarded as desert, or, at most, as sterile grazing lands, may not prove to be arable land of the very best quality when irrigated; and the almost daily discovery of new means of irrigation. It was roughly estimated in 1878 that there were about 15,000 square miles of arable lands, or lands which would become arable with irrigation, in the State. With the great increase of irrigating canals constructed since that time, and the large body of good lands which was thrown on the market by the treaty with the Utes, confirmed by Congress in June, 1880, which set free nearly 11,400,000 acres, and the cultivation of the great parks which is just beginning, there can hardly be less than 25,000 square miles entitled to that designation to-day, or in round numbers, 16,000,000 acres. Probably not more than one-fifth of this is under cultivation, though the amount is rapidly increasing. "The soil at the first glance does not look promising. It is composed of a fine, dark-brown mould mixed with gravel, very compact, but at the same time very porous and friable. When the gravel has been completely decomposed, or the soil consists of fine dust, blown or washed from the higher portions of the plains (called bluffs), it inclines to clay. Near the surface the earth is darker than lower down, but the quality is essentially the same and very uniform throughout. The soil is indeed so rich in the mineral constituents of plants, and its depth so great, that with a proper supply of water, it yields larger and finer crops of wheat, barley and oats than any other State in America. Water, however, is necessary, except in the bottoms of the shallower valleys traversed by streams; and the cultivable land is thus limited to the area that the water of the mountain streams will suffice to irrigate. The agricultural portion of the State is now mainly the strip of land, ten to thirty miles broad, which extends from north to south, the whole width of the State, along the plains at the base of the foot-hills. Owing to the general flatness and gradual sloping character of the ground the land can be irrigated at small cost. Between Denver and the northern boundary of Colorado, six principal streams, besides the river Platte, flow from the foot-hills across the plains. The water from these streams is con-



CANON OF THE COLORADO.

veyed in canals or ditches, which are sometimes as much as fifty miles long. Some of the smaller canals have been built by co-operation among the farmers. In other cases they are owned by local joint-stock companies, of which the shares are held principally by the farmers themselves. The largest of all—the Larimer and Weld Canal—is the property of the Colorado Mortgage Company of London. It is fifty miles long, from twenty-five to thirty feet wide at the bottom, and carries water to irrigate 40,000 acres. The company itself owns 20,000 acres, which, with a right in perpetuity to sufficient water for irrigation, it is selling at \$13 to \$15 per acre. The land is sold in quantities of eighty acres and upwards. At this rate the land is freely purchased, payment being taken in five installments for the convenience of buyers. Settlers on the public lands can buy water for \$5 per acre. By homesteading a settler can become owner of 160 acres for a few dollars, but he must reside on it for five years before he can get a title. The settler may choose to pre-empt, in which case residence for six months, together with the execution of certain improvements, gives a title. By pre-emption the land may be obtained for \$1.25 an acre if distant from a railway, or \$2.50 an acre if in the vicinity of a railway. A settler can only homestead or pre-empt once. Railways are owners of land along their lines, in square miles alternately with the public lands, which are subject to homesteading and pre-emption. Railways sell their land at prices varying from \$3 to \$6 an acre, according to circumstances.

“The undulation of the plains makes plowing and irrigation very easy. The water is supplied to the farmer, not directly from the main canal, but from a subsidiary ditch, formed with a plow along the surface of the plain, on a nearly uniform slope. The farmer excavates with his plow a similar smaller trench along the top of the land he intends to plow, and then, making breaks in the lower side, allows the water to flow over the whole surface of the field. After two or three days the land is ready for plowing, and the water is turned off. After irrigation, a pair of light horses will turn over the soil at the rate of an acre a day, or a gang-plow, drawn by four or six horses, will break up

ten acres in the same time. Cereals require to be watered once or twice in the season. The custom is to break new land in August, September, and October, turning the sod two or three inches deep, and the winter frost pulverizes it, and makes it into a good seed-bed by spring. Old stubble-land is irrigated in a similar manner before being plowed, either in autumn or spring, and the seed is sown as soon after plowing as possible. The soil, once thoroughly wet, is very retentive of moisture, and no more irrigation is necessary till June, when the water is again turned over the crops for a day or two. The land is very easily tilled and cleaned, and irrigation is a simple process, as may be easily understood from the fact that one man alone (exchanging, it may be, help with a neighbor in harvest) can cultivate eighty acres under crops in rotation, and that, too, without working so hard as a small farmer in this country (England). Self-binding reaping machines are in general use, and give complete satisfaction. Threshing machines, driven by steam or horse-power, are driven from farm to farm as at home.

“Colorado produces all kinds of crops and vegetables grown in England, with the addition of many that flourish only in a warmer climate, such as Indian corn, sugar-beet, tomatoes, etc. Grapes and peaches ripen in the open air, and in the southern parts of the State grapes and plums grow wild. Flax is also occasionally met with, growing wild. The wheat and barley raised on the irrigated lands are as fine as any in the world.

Geology and Mineralogy.—Within the limits of the State, on its varied surface, down the precipitous sides of its lofty mountains, and on the deeply eroded sides of its great cañons may be found every geological formation known on this continent. In general it may be said that the plains of Eastern Colorado are tertiary and alluvial, being formed largely of the loess which has for ages washed down from the mountain summits. The axis of the Rocky Mountain ranges is eozoic, and yet it has been so completely upheaved that the granite strata are completely broken and reversed, and form the surface rock of the summits of the highest mountains. In the valleys between the ranges

the great parks are tertiary. At numerous points on the mountain sides and in the cañons the coal crops out, sometimes tertiary lignites, but as often from the upper coal measures, and in the southwest from the lower coal measures. Sandstones, limestones, slates and shales of every geologic age crop out, especially in Western Colorado, and triassic and Jurassic rocks appear both in the San Juan country and in the region lying between Pueblo and the Spanish peaks. In the vicinity of many of the coal beds the rocks are cretaceous; while the Devonian and Silurian systems are largely represented in the south and southwest. In the upper valleys of the Rio Grande del Norte, and in the vicinity of some of the affluents of the Grand river, there are evidences of extensive volcanic action.

The erosive action of large streams having a rapid descent and perhaps also of glaciers (though this is not quite settled) has nowhere produced such remarkable results as in Colorado. It is not only manifest in those deep cañons which are only rivalled in Arizona, but in such wonderful productions as the "City of the Gods," in the White river region, in the northwest part of Summit county, where a tract large enough for a city is cut into the semblance of cathedrals, castles, towers, and dwellings, in ruins indeed, but glorious in their ruin—the spires, domes, terraces and many storied temples set in such regular order and with such broad avenues between that it seems impossible that it should be other than the work of human hands; or the similar though less extensive wonders of Monument Park, Talbott Hill and the Bottle Rocks; or the remarkable arrangement of the rocks (which may or may not have been the result of erosion) in the "Garden of the Gods;" or the Royal Gorge, or the Grape Creek and Temple cañons, or the Grand cañon of the Arkansas, and farther west the Great cañon of the Gunnison.

For an interesting account of some of these wonders, especially those of Frémont county, as well as of the remarkable bones of the gigantic *Camarasurus* and other fossils, reptiles and mammals of the Jurassic period which, in size as well as geologic age, surpass all previous discoveries, we are indebted to Mr. J. G. Pangborn, author of the "New Rocky Mountain Tourist," a part

of whose very vivid description of a tour through this true wonderland we here introduce to our readers.

"Rattling over the bridge spanning the Arkansas at the city's* feet, we speed on through clumps of richly foliated trees, and in a few moments are at the entrance of the cañon, catching a glimpse, just as we enter between its towering walls, of the Grand cañon of the Arkansas and the cosy-looking bath-houses at the springs near by. A quick word of wonder at the height and the closeness of the walls, a sharp turn of the road, and looking back, the way is lost by which we came. Here in the solitary mountains we are alone. No world behind; no world before. Turn upon turn, and new walls rise up so abruptly before us as to cause an involuntary cry of terror, soon relieved, however, as our excited senses become more familiar with the new tension upon them. Awe still holds us bonden slaves, but the eye drinks in such beauty as fairly intoxicates the soul. On either hand the walls loom up until only the slender opal of a narrow strip of sky forms exquisite contrast with the pine-covered heights. Rifled boulders every now and then wall in the road on the river side, their base washed by the creek, wild and beautiful in its whirl and roar. Here the perpendicular piles of rock are covered with growths of trees that ascend in exact line with the wall and cast their shadows on the road below. Nature's grapevines trail along the ground and cling around the trunks of the trees, hanging like Arcadian curtains and making bowers of the most exquisite character imaginable. Between these, we catch bewitching glances of the creek on its merry, tempestuous way to the Arkansas, its sparkling surface throwing back rapid reflections of masses of green foliage and trailing vines. Deep pools give back the blue of the cloudless sky, and as base accompaniments come in the dark shadows of the cañon walls with their sharply drawn ridges and truncated cones. Here and there, all along the wild way, are rushing cascades, tortuous twists of the stream, gayly lichened or dark beetling rocks, mossy nooks or glowing lawns, and overhead the cottonwoods mingling their rare autumnal splendors of red and gold with the sombre green

* Cañon City.

of pine and cedar. The cañon is beyond question the most beautiful in marvellous coloring, wondrous splendor of foliage, picturesque cascades and winding streams of any in Colorado. The Grand cañon of the Arkansas is deeper, but it is awful as seen from the only point of view, that from the top, and the sensations caused in strongest of contrast with those experienced in Grape Creek cañon. The walls of the latter are so gorgeous a variety of colors as to fairly bewilder with their splendor: red—from the darkest tinge of blood to the most delicate shades of pink; green—from the richest depths to the rarest hues of the emerald; blue—from the opal to the deepest sea, variegated until almost defying the rainbow to excel in exquisite blending. These glorious transitions of color meet one at every turn, and the contrast formed every now and then by tremendous walls of bare, black rock, or broad seams of iron ore set in red or green, render all the more striking the singular beauty of the cañon. Over the walls on either side, the grapevine, from which the cañon takes its name, climbs in wonderfully rich profusion, and in autumn, when the leaves become so delicately tinted and the vines hang thick with their purple fruit, the effect is something to call to mind but never to describe. Added to the indescribable beauty of the vines are the many-colored mosses which paint the rocks in infinite variety of hue, oftentimes growing so high and rank as to reach to the very pinnacle of the topmost rocks and fringe their craggy brows so lavishly as to render them almost symmetrical in appearance as seen below. At different points these moss-covered walls rise to the height of 1,000 feet, and so completely do they hem one in on all sides that with but slight stretch of imagination the place could be viewed from below as a gigantic, moss-covered bucket, but one that never 'hung in the well.' Just above Temple cañon, and where Grape creek enters the cañon of its name, the walls are exceedingly high and precipitous, and in the coolest nook of their shadows, where sunlight can never reach, is a quiet, placid pool of water clearer than a crystal, and so faithfully reflecting back the curiously and brilliantly colored rocks overhanging it, as to have gained the name of Painted Rock Pool. It is a very gem in itself, and its setting

and the rare grandeur of the surroundings, is well in keeping. Those visiting the cañon should not fail to follow up the course of the creek from the point where it debouches into the cañon. It will have to be done on foot, but the wholly unexpected surprises of the hour or two's ramble will more than repay the exertion. The walls of the sides of the parent cañon are fully 1,500 feet in height, and so narrow that the tall pines and cottonwoods keep the gorge in a tender half-light, broken at mid-day by glaring rays that give a magical charm to the scene. On all sides from points in the walls of rock, tufts of grass and blue-bells grow, forming, with the grapevines, most pleasing pictures in contrast with many-tinted rocks, in the crevices of which their roots have found nourishment. The walls are of almost as many colors as there are sharp turns in the creek's course, and rare and perfect in beauty is the amphitheatre of black rock with pearly-white veins running in every direction, the whole overhung by climbing vines and their pendant berries. Just at the entrance to Temple cañon is a little grove of cottonwoods. Their pendant swinging boughs meet in perfect arches overhead, and the profusion of their polished, brilliant leaves renders complete the most charming of bowers in which to take the noon-day lunch and prepare for the climb into Temple cañon, which must be done on foot. Temple is a side cañon, with entrance from Grape Creek cañon, some four and a half miles from Cañon City, and was discovered but a year or two ago.

"The climb is not steep, though rather rough, especially to effect an entrance into the Temple proper, which is to the right of the little cañon, and can only be accomplished by clambering over several-huge boulders, which, if removed, would render the illusion of a temple and stairway all the more striking. Once passing in through the great rifts of rock, for all the world like the stairway to some grand place of amusement, the body of the Temple is reached, and to the tourist's astonishment, before him is a stage with overhanging arch, with 'flats' and 'flies,' with dressing-rooms on either side, and a scene already set as if for some grand tableau. If so intensely realistic from the parquet, as the broad circling floor might aptly be termed, or from the

parquet or dress-circles, as the higher ledges would suggest, the clamber up to the stage itself renders it all the more so, for there is found ample room for a full dramatic or operatic company to disport upon, while in the perpendicular ledges and caves on either side, twenty-five to thirty people might retire and not be observed from the body of the hall. The stage is at the least thirty feet deep, and some sixty to seventy broad; the arch above fully one hundred feet from the floor of the cañon, the stage itself being about forty feet above the floor. The arch is almost as smooth and perfectly proportioned as if fashioned by the hand of man, and during the wet season the water from a stream above falls in a great broad sheet over its face to the floor of the cañon below. At such times the effect from the stage of the Temple is, as can be imagined, exceedingly fascinating, for there, entirely protected from the water, one looks through the silvery sheen out upon the scene below. Upon the rear wall of the stage quite an aperture has been hewn out by some action, and the shape it is left in is peculiarly suggestive of tableaux preparation. Away up in the very highest crevice under the arch a pair of eagles have mated for years, and though most daring efforts have been made to reach the nest none have succeeded. The coming of visitors is almost invariably the occasion of a flight from the nest, and breaking in so suddenly upon the supernatural stillness of the place is apt to cause a shock to the timid not readily forgotten. There is absolutely not a solitary sign of vegetation about the Temple; all is bleak, bare and towering walls, and a more weird spot to visit cannot possibly be imagined. Coming out from the Temple itself the tourist should by all means clamber up to one of the lofty pinnacles in the adjoining cañon, for the sight from them down upon the mighty masses of rock below, the cottonwoods, the stream in Grape Creek cañon and the lofty walls beyond is one to be treasured up among the brightest recollections of the tour.

“One could spend days in Grape Creek and Temple cañons alone, but our week demands that we should spend the second day in Oak Creek cañon, with its wonderful formations of arches, deep tints of evergreens and wealth of wild flowers.

"Oak Creek cañon is left with unfeigned regret, and as we toil up the ascent on the return trip we cast many glances back to aid memory in fixing its beauties upon the mind. A couple of miles over a road the tamest imaginable, after the three miles of down grade, brings us to the base of Curiosity Hill, well named, as is speedily proven by the discovery of all sorts of odd and beautiful little specimens of ribbon moss and linear agate crystals and the like. The surface of the hill is one vast field of curiosities, and so plentiful and varied are they that even those usually wholly indifferent to such things soon find themselves vying with the most enthusiastic in exclamations of delight upon finding some particularly attractive specimen. By blasting, large bodies of the most perfect crystals are obtained, invariably bedded in ribbon agate of the most beautiful colors and shapes, and polishing readily, they form beyond all comparison the loveliest of cabinet attractions. Many very valuable specimens of blood agate have been found on Curiosity Hill, and for agates of all hues and forms it is possibly the most satisfactory field for the specimen-seeker in Southern Colorado. Trotting homeward we watch the blazing splendor of the sunset upon the lofty heads of the rocky monarchs around us, while the cool twilight of the open park between us and Cañon City envelops all about our road.

"Next morning we are off for Oil Creek cañon, which is wholly different from others seen thus far. The windings of the road in following the heavily-wooded stream are decidedly of a romantic character, running now through a bewitching little grove, and the next moment joining with the merry waters and keeping them close company until another cluster of aspens or firs causes a separation of sight only, for the music of the foaming stream comes to us through the leaves, thus rendering the meeting all the more delightful. A half mile from the mouth of the cañon we come upon the oil wells from which the stream takes its name, and about which its perfect purity is polluted by the petroleum that lies thick upon its surface. Some considerable surface work has been done at the wells in the way of tubing and the like, and they have been yielding more or less oil for

the past fifteen years. Preparations are now being made, however, for boring for flowing wells, and the probabilities are that more oil will be taken from them this year than ever before since the first discovery. Beyond the wells the road winds around and about in enticing proximity to the stream, and then leaving it, winds high above, crossing picturesque bridges, and finally emerges into the open known as Oil Creek Park, hemmed in on all sides by ranges of sandstone that show a countless succession of rock sculptures, the effect heightened by the brilliancy and variety of the coloring. High up on the ridges are the crumbling ruins of castellated battlements, formidable bastions suggestive of frowning guns, lofty and imposing sally-ports, portcullis, moats and drawbridges. Great cliffs have fallen, and avalanches of rock have plunged their way down the hillsides; yet here and there and everywhere upon the walls stand the grim battlements, as if defying wind, storm and time. The most imposing of these tremendous ruins are the Twin Forts, standing upon the very verge of a precipitous wall of 500 feet of alternate layers of creamy yellow and brilliant red. One looms up a hundred feet or more above the wall, but the other is sadly battered and rapidly crumbling away. Along the wall are numberless towers of rock worn by the action of the elements into fantastic shapes, and many of them looking as if the breath of a child would topple them over. Progressing on through the park we fancy in each transformation of rock some familiar thing, while the mighty tiers extending toward us oftentimes call vividly to mind the bulwarks of great ships of the sea stranded here to be worn away to dust. Directly ahead of us, as we near the centre of the park, we catch full glimpses of new and singular rock sculpture, the entire south end of the park showing tier upon tier of rock so striking in resemblance to stockades and outlying fortifications as to cause one to involuntarily seek not only for the colors, but the soldiers defending them. Back of the stockades, stern, dark and cold, rises Signal Mountain, and still back of it the long, wave-like lines and great snowy domes of the Sangre de Cristo range, their stupendous proportions dwarfing all below into littleness.

"The road, as it nears the head of the park, abruptly dashes into a thickly grown grove of piñon trees. We halt for a moment to get a full view of the largest piñon tree in Colorado, and probably in the country, and after entertaining something of a contempt for the scraggy little trunk of the average piñon tree, it is quite refreshing to behold one fully three feet in diameter, though all the more uncouth and ugly for its unwonted circumference. The piñons bear extraordinary quantities of the sweetest little nuts, but outside of this they are of no possible worth. Around the sharpest and steepest of curves, a dash across the madly-surfing stream, and a helter-skelter scramble up a low but exceedingly rocky ascent, and we are at the mouth of Marble Cave, so near in fact as to barely escape falling into it in looking for it. The ragged, jagged crevice by which the cave is entered is anything but enticing, and the sensation experienced as one's head is all there is left above ground is far from the pleasantest.

"The descent is almost perpendicular for a hundred feet or more, and the staircase formed by the broken ledges on either side of the chasm far from soothing to one's nerves, especially as all the lights obtained are the meagre glintings which steal through the three-cornered opening above and struggle faintly half way to the bottom of the rift of rocks. Stumbling over unseen boulders, and barely escaping serious contact with the encompassing walls, we grope to the point where our guide has kindled a fire, and find it the intersection of the two main halls of the cave. The ghastly flare thrown upon the walls by the burning pine chills us to the bone, and a tremulous inspection of the situation adds no warmth. We are in a strange and awful rift in some buried mountain, the walls so narrow that our elbows touch on either side, and so weird and terrific in height, as seen through the heavily-rolling smoke, as to look ten times the 150 feet our guide informs us is the distance to the roof. The pine burns brighter, the smoke grows thicker, but we press on, now crawling on all-fours into some wondrous chamber of stalactite and stalagmite, and anon tugging up a strand of rope over frightful boulders that have fallen from the dizzy height

above, to obstruct man in learning the secrets of this awful convulsion of nature. We penetrate into Satan's Bower, we look shudderingly into his Punch Bowl, and gasp as we throw ourselves into his Arm-Chair. We draw longest of breaths in Queen's Grotto, and the shortest when thoughts of the way back over those fearful rocks crowd in and demand consideration. Certainly the clear blue sky never was half so lovely as when we finally stand under it again. The cave is, as its name implies, encompassed by marble walls, and the specimens of marble brought from its innermost recesses, as seen in the full glare of the sun, are exceedingly beautiful in their mottled surface of red and white. The marble is susceptible of the highest and richest polish, and parties in Cañon City use it for artistic as well as practical purposes. All about the hill, from the low crest of which the cave is entered, are the finest specimens of jasper, agate and shell rock, and not far distant are immense trees petrified to solid rock, and where broken often showing beautiful veins of agate and crystals. On the return trip we take more notice of the cosy and comfortable farm-houses scattered throughout the park, and become much interested in the details of the yield of grain—principally wheat—secured through the system of irrigation practised so extensively in the State; in fact, no grain whatever can be successfully cultivated in Colorado without irrigation. Midway in the park we pull up at the pleasant home of the gentleman who is to show us to the top of Talbott Hill, where Professor Marsh, of Yale College, and Professor Cope, of the Academy of Natural Sciences, Philadelphia, have parties at work exhuming the recently discovered bones of animals, compared to which in proportions and importance the mastodon sinks to insignificance. We at once leave the road and make direct for the wall of blood-red rock on the west side of the park, and a short drive bringing us to its base, we alight. Reaching the summit, the long-drawn breath of relief is half choked by the indescribable magnificence of the view, and for the first time we appreciate the sublimity and grandeur of the Sangre de Christo range. A few more steps and we are at the tent of Professor Cope's party, and all within and without is

heaped-up bones, rocks now, and many of them so perfectly agatized that at a casual glance it would stagger any but a scientist's belief that they were ever covered with flesh. As seen, here, however, it is so palpably apparent that the seeming rock and agate are bone as to leave no room for shadow of doubt. Before us are perfect parts of skeletons so huge as to prepare one for the belief that Noah's Ark was a myth; sections of vertebræ three feet in width; ribs fifteen feet long; thigh-bones over six feet in length—and the five or six tons of bones thus far shipped East comprising only the parts of three animals. In one pit the diameter of the socket of the vertebræ measured fifteen inches, width of spinal process forty-one inches, and depth of vertebræ twenty-nine inches. In another place there was a thigh-bone six feet and two inches in length; a section of back-bone lying just as the monster rolled over and died, with eleven ribs attached, the back-bone twenty feet long and from sixteen to thirty inches deep, and the ribs five to eight feet in length and six inches broad. Just showing upon the surface was a part of a thigh-bone twenty-two inches in width and thirty in length, and near it a nine-foot rib four inches in diameter, a foot wide at six feet, and where it articulated with the vertebræ, twenty-three and a half inches in width. The entire rib was fifteen feet in length. All over the hill we come upon little piles of broken bones which will require days of patient labor and skillful handling to properly set in place. The first discovery of the fossils was made in April last by a young graduate of Oberlin College, who, teaching a country school in the park five days in the week, spent his Saturdays about the hills hunting deer, and occasionally getting a shot at a grizzly. Immediately upon satisfying himself of the character of the discovery, the young man wrote to his old Professor in Ohio, and subsequently to Professor Cope, of Philadelphia. Hardly had the latter organized his party of exploration before Professor Marsh had his, under the leadership of Professor Mudge, of Kansas, duly equipped, and by the middle of May both parties were actively engaged excavating, setting up and preparing for shipment the bones which Professor Marsh declares are seven million years old.

“The first animal discovered was of entirely new genus and species in scientific circles, and was named the *camarasuras supremus*, from the chamber of caverns in the centres of the vertebræ. Of the first petrifications exhumed was a femur or thigh-bone six feet in length, scapular or shoulder-blade five and a half feet long, sacrum, or the part of the backbone over the hips—corresponding to four vertebræ united in one—forty inches. Vertebræ immediately in front of this measured in elevation two feet six inches, and the spread of the diapophyses was three feet. Professor Hayden, the widely-known chief of the United States Geological Survey, upon visiting this place and inspecting these and other parts of the animal, declared it his conviction that the beast must have been fully a hundred feet in length. The thigh-bone, measuring some six feet, stood over the hips eighteen to twenty feet. The animal was undoubtedly shorter of front than of hind legs, and Professor Marsh thinks it had the power to raise up like a kangaroo on its hind legs and browse off the leaves of the trees from sixty to eighty feet in height. The professor also gives it as his opinion that the ‘critter’ fed entirely upon grass and leaves, the vertebræ of the neck being some twenty-one inches in length, and the spread of the diapophyses three feet, this being understood of cervical vertebræ. The skeleton is not completely exhumed, though between 7,500 and 8,000 pounds of bone have been shipped to Professor Cope. A part of the jaw of a *lælaps trihedrodon*, ten inches long, and containing eight teeth varying from five to eight inches in length, has also been shipped. Recently a leg bone of this same animal was exhumed and found to measure a little over four feet, and with a portion of the head all crushed into small pieces, sent on to the professor. A part of the femur of another animal has been found, measuring six feet, but somewhat lighter than the others. The vertebræ are three feet six inches in elevation, showing a very tall brute, but not so heavy as the *camarasuras*. When found, it was lying on the right side with vertebræ and ribs of that side in place, the ribs measuring over six feet in length, and the prongs where they join the back fifteen inches in width. Many of the bones of the *camarasuras* are misplaced

and broken up, quite a pile being found at the spot where several of the teeth of the trihedrodon were discovered, thus indicating the preying of the one upon the other. While the general estimate of the age of these huge fossils among American geologists is seven million years, English scientists declare them fourteen million years old. Both the *camarasuras* and the *trihedrodon* were of the Jurassic period, being found in beds, which, according to Professor Marsh, correspond with the Wealden beds of England. All this section of the country must have been a plain when so much of Colorado was covered by an ocean, and before the mountains were formed. The fossils are found in rock long upheaved, its character now a sort of shale or marlite, which upon being dug out and exposed to the air crumbles to pieces. In most instances it is free from bone decay, the parts of animals taken out being remarkable for their clean and perfect solidity. Marsh and Cope agree that the *camarasuras* was the largest and most bulky animal capable of progress on land of which we have any knowledge, it being very much larger than the *mastodon*, which was of a much later period.

"Professor Mudge, with his party, is working about three-quarters of a mile distant from Professor Cope's camp, and very recently discovered portions of an animal of even more monstrous proportions than those already referred to, and of entirely different genus and species from either. The explorations of the Marsh and Cope parties will be pushed with all possible vigor, the entire scientific world being intensely interested not only in the work here on Talbott Hill, but in the setting up of the gigantic skeletons at Yale College and the Academy of Natural Sciences at Philadelphia. Excursions from several of the leading colleges to the scene of the discoveries are planned for the summer, and the season's work promises to add to the lively interest in scientific circles.

"The next morning our way is southward ten miles or more to the coal mines, stopping at the iron spring a little over three miles from town. It is up a short, dry gulch leading off from the road, and quite peculiar, inasmuch as the water springs from and has worn its tiny channel up the very edge of a long, thin ridge that

juts out into the gulch. Over the face of the ridge the water has scattered its iron sediment with lavish freedom, but only in this is there anything that to the eye indicates aught but spotless purity in the wonderful clearness of the spring. To the taste, however, the iron at once asserts itself, and the water is so strongly charged with it as to render it the healthiest of beverages. We drink our fill, and are off for the coal mines. An hour, and we are bowling along in a coal truck attached to a blind mule, through a vein of solid coal something over five feet in diameter. It is a weird ride, this mile or more into the inky bowels of the earth, the faint shadows from our diminutive lamps causing a ghastly effect not at all lessened by the blackness of the coal on either side and overhead. Every few feet we peer into the dusky depths of the apparently unending series of side chambers, catching quick glimpse of the little fire-bugs, as the miners look to be, as we pass so swiftly on. We see not the forms of the men, their faces, nor their hands, only the lamp-wicks' sickly flaring from the unseen hats. Every now and then piles of powder in canisters almost block up the entrance to the chambers, and at one point we are shown the very fuse that sent a poor miner to his death but a day or two before. But still the old, blind mule trots on, and the passing through and rapid closing behind us of the heavy, oaken door, that preserves the little of wholesome air left in the drift, is as if it barred us forevermore from the world behind. The ride in appears an age; the ride out but of a moment's time in comparison. There are eighty-six side chambers, or rooms, as the miners know them, in the main entry, fifty-seven in another entry, and in all, four miles of track upon which the coal is carried to the outer world. The veins average five feet two inches, and run three and one-half miles east and west, and ten miles north and south. A hundred miners are at work, and the yield averages 400 tons per day. The gigantic, solid lump of coal eight feet nine inches long, six feet across and four feet four inches high, that attracted such great attention at the Centennial, being beyond all comparison the greatest single piece of coal on exhibition, was taken from this mine. It weighed seven tons, and was cut and brought out

of the mine in three days. Cañon City coal is probably the finest bituminous coal in the world, and is so extensively used throughout the West as to require the running of special trains for coal alone, on the Denver and Rio Grande road, which has its own track to the mines. The supply is beyond all human calculation, for the valley of the Arkansas is one vast coal bed for mile upon mile.

“On the return trip we make quite a detour to the east, to spend a little time at the gypsum beds, which are twelve feet in thickness.

“Leaving the hotel immediately following an early breakfast, next morning, a drive of twelve miles brings us to the Grand Cañon of the Arkansas. Disappointment is bitter, and feelings of resentment almost beyond control, as nowhere can the eye discover the cañon. In the immediate foreground the piñon growth is rank and dense; just beyond, great, bleak ridges of bare, cold rock contrast strongly with the profusion of foliage hiding everything beneath from sight, while away in the dim distance the snow-crowned peaks of the continental divide are outlined sharp and clear against the solid blue of the morning sky. Though grand beyond anything we have seen in amazing extent of vision, the mind is so wrapped up in the anticipation of full realization of the gloom, and vastness, and solemn grandeur of the Grand Cañon, as to resent almost angrily their apparent absence. A half dozen steps from the clump of piñon trees where the horses have been fastened, and all thoughts of resentment, of disappointment and chagrin vanish, and a very cry of absolute terror escapes us. At our very feet is the cañon—another step would hurl us into eternity. Shuddering, we peer down the awful slopes; fascinated we steal a little nearer to circumvent a very mountain that has rolled into the chasm, and at last the eye reaches down the sharp incline 3,000 feet to the bed of the river, the impetuous Arkansas, forty to sixty feet in width, yet to us a mere ribbon of molten silver. Though surging madly against its rocky sides, leaping wildly over gigantic masses of rock and hoarsely murmuring against its imprisonment within these lofty walls, it finds no avenue of escape. Every portion of these marble

bastions is as smooth as if polished, and as stationary as the mighty walls that look down upon them from such fearful height,

“Fairly awed into a bravado as reckless as it is strange to us, we crawl out upon tottering ledges to peer into sheer depths of untold ruggedness; we grasp with death-like clutch some overhanging limb and swing out upon a promontory beside which the apex of the highest cathedral spire in the world would be as a sapling in height. We crawl where at home we would hardly dare look with telescope, and in the mad excitement of the hour tread, with perfect abandon, brinks, the bare thoughts of which, in after recollection, make us faint of heart and dizzy of head. Eager now for still greater horrors of depth, blind to everything but an intolerable desire to behold the most savage of nature's upheavals, the short ride to the Royal Gorge is made with ill-concealed impatience. If our first experience upon the brink of the Grand Cañon was startling, this is absolutely terrifying, and the bravest at one point become the most abject of cowards in comparison at the other. At the first point of observation the walls, though frightfully steep, are nevertheless sloping to more or less extent; here at the Royal Gorge they are sheer precipices, as perpendicular as the tallest house, as straight as if built by line. So narrow is the Gorge that one would think the throwing of a stone from side to side the easiest of accomplishments, yet no living man has ever done it, or succeeded in throwing any object so that it would fall into the water below. Many tourists are content with the appalling view from the main walls, but others, more venturesome, work their way 600 to a 1,000 feet down the ragged edges of a mountain, that has parted and actually slid into the chasm, and as we have come to see it all, the clamber down must be accomplished. For some distance we scramble over and between monstrous boulders, and then reach the narrow and almost absolutely perpendicular crevice of a gigantic mass of rock, down which we must let ourselves 100 feet or more. As we reach the shelf or ledge of rock upon which the great rock has fallen and been sundered, we glance back, but only for a second, the thought of our daring making us grow sick and dizzy. But a step or two more, and the descent just

made sinks into utter insignificance compared to what is before us. Then we had the huge walls of the parted rock as the rails of a staircase; now we have naught but the smooth, rounded surface of the storm-washed boulders to cling to, and on either side of our narrow way, depths, at the bottom of which a man's body could never be discovered with human eye. Behind us the precipitous rocks, over and through which we came; ahead of us the slender barrier of rock overhanging the appalling chasm, and all there exists between us and it. Cowards at heart, pale of face and with painful breath, we slowly crawl on hands and knees to the ledge, and as the fated murderer feels the knotted noose fall down over his head, so feel we as our eyes extend beyond the rocks to catch one awful glimpse of the eternity of space. Few dare to look more than once, and one glance suffices for a comprehension of the meaning of the word depth never before even dreamed of, and never afterward forgotten. The Gorge is 2,008 feet sheer depth, the most precipitous and sublime in its proportions of any chasm on the continent. The opposite wall towers hundreds of feet above us, and if possible to imagine anything more terrifying than the position on this side, that upon the other would be, were its brink safe to approach. Overhanging crags, black and blasted at their summits or bristling with stark and gnarled pines, reach up into profoundly dizzy heights, while lower down monstrous rocks threaten to topple and carry to destruction any foolhardy climber who would venture upon them. Among all the thousands who have visited the Grand Cañon and the Royal Gorge harm has befallen none, for, despite the seeming horror of the situation, the appalling depths and rugged paths, the fascination of the danger appears to give birth to greatest caution. The Cañon, except in the dead of winter, is approachable only from the top, the walls below being so precipitous, and the river such a torrent, as to defy all access. When frozen, as the waters are for brief periods during the coldest months, the way up the cañon may be accomplished, but only at the risk of personal comfort and not a little danger. Mr. Talbott, the photographer at Cañon City, ventured into the cañon last winter with his apparatus, and, after infinite

trouble, secured the excellent views which afford us some conception of the grandeur of the gorge from the bottom.

"Returning to Cañon City, we conclude to remain about the hotel for a day resting, and deciding upon the route of a tour through Southern Colorado, taking in the San Juan country, Chalk Creek, California Gulch, Twin Lakes, South Park, etc. We have enjoyed to the fullest the jaunts of a day, and now long for a month on the road with headquarters wherever night may overtake us. The reader may be inclined to ask if there are no more comparatively short trips, with Cañon City as the base, and the reply would be, there are, and so many in fact as to be almost beyond enumeration. A most enjoyable four to five days' tour is that from Cañon City to the wild and picturesque region of the Sierra Mojada, or Wet Mountains, thirty miles *via* Oak Creek Cañon to Rosita, altitude 8,600 feet, and return *via* Wet Mountain valley and Grape Creek cañon. This is a 'timber liner,' as an old prospector would denominate so wide and high a range of altitude, and affords capital opportunities for the enjoyment of life oftentimes above the clouds. Near Rosita are several distinct craters, and in the very accessible grass-covered, cone-shaped hills that rise 500 feet or more above the town are innumerable mines. About them are found the most beautiful specimens of crystallization, different kinds of spar and pyrites of most brilliant hues. The ride down the little grassy gulch or glade to obtain a nearer view of the Wet Mountain valley, and the Sangre de Christo range beyond its western limit, is a very delightful one, looking at sunset time like some grand painting with the point of view at the small end of the vista, and the eye, ranging down the timber-girted glade to mountains 13,500 feet in altitude, beholds the massive and majestic peaks rolling and swelling against the clearest sky ever mortal eye was gladdened with. Many Englishmen have made homes in the valley, often called 'The Britons' Paradise,' a name which seems appropriate to the tourist, after leaving the grayish green of the foot-hills and reaching its bright green meadows, starting up here a prairie dog and there a rabbit, and crossing and recrossing its trout-filled silvery streams. In the valley is the famous

Lake of the Clouds. The fourth night ends at Cañon City, and the expense of the trip hardly averages \$5 per day, including everything. Another exceedingly pleasant trip from Cañon City is to Poncho Springs, sixty-five miles up the Arkansas river, for which a running description of the drive through the Upper Arkansas cañon will suffice. Engaging a seat in the regular buckboard line leaving Cañon City every other day, the start is made immediately after early breakfast, and the sun is hardly over the mountains before the sublimely grand confines of Grape Creek cañon are reached. A word as to the buckboard, for beyond all comparison the most comfortable and enjoyable of all vehicles for mountain travel, it deserves at the least a passing mention. Built expressly for Barlow & Sanderson, the great stage men of Colorado, the buckboard of their lines is a roomy, double-seated, open vehicle, the slatted bed lying directly upon the axles, and the seats set well up on fish-plate springs, the jar consequent upon striking rock or stone is almost lost before it reaches the seat. There is none of the rolling, swaying motion of the bulky coach, or of the short, jerky action of the aptly named 'Jerkee.' There being no top, the eye ranges at will, and the bed of the conveyance is so near the ground one can readily spring out and walk when so inclined, many preferring so to do when climbing long hills.

"Emerging from Grape Creek cañon the road winds through Webster Park, thence into Copper Gulch, at the head of which is a towering gateway of solid rock, and passing through it to the top of the divide the scene is grand beyond all conception. Directly ahead is the snowy range, with its white-capped crests looming high above the clouds, which hang about the rocky breasts below as if loth to leave their ample resting-place. To the left is the Greenhorn range, to the right the great continental divide, and imagination could not picture sight more sublime. Through Seven-mile Gulch the road enters Pleasant Park, with its rugged rock sculptures, its densely-wooded slopes and grassy lawns. On every side are most curious monuments formed of monster boulders one atop the other, and holding position, by apparently so frail a thread, that the gust of a mo-

ment's duration would hurl them from dizzy heights to the level of the park. While in the park, magnificent views are obtained of Mount Blanca and Pike's Peak, either of them not less than eighty miles away, and at the summit of the divide between Pleasant Park and the South Arkansas—altitude 7,800 feet—the view in all directions is beyond description. From this the descent is commenced; at nightfall the solid, comfortable and roomy old stone house, known, Colorado over, as Bales', is reached, and with it the South Arkansas. Twenty miles farther is the Chalk Creek region, with its hot springs, fishing and hunting, and thirty miles beyond are the noted Twin Lakes. Fifteen miles from the lakes is California Gulch, with the wonderful Mount of the Holy Cross to the north."

There are, in the southwestern part of the State, in La Plata, Conejos, and San Juan counties, and around the head-waters of the sources of the San Juan river, many of those ruins of houses cut in the rocks of the perpendicular cliffs, or on the summits of the isolated *mesas* or table-rocks, of which there are so many hundreds of examples in New Mexico, Arizona and Southern Utah. This whole region was densely populated ages ago, and by races far superior to the existing tribes of Indians. The Moquis, already described in our account of Arizona, may possibly belong to the same race with these cliff-dwellers, for they have similar ideas in regard to their dwellings and languages, customs, habits and religion, entirely diverse from any of the other Indian tribes, but some of these ruins are many centuries old. They were in their present condition of ruins when the Spaniards first penetrated here, 330 or 340 years ago. That they had formidable enemies, whose attacks they evaded by their fortified dwelling-places, seems evident; but whether those enemies were Apaches, Aztecs, or other tribes or nations, now, like themselves, extinct, does not clearly appear. The extent of these ruins, often 250 by 600 or 700 feet, the massive blocks of stone of which some of them are constructed, and the vast labor by which others were hewn out of the solid rock, are well fitted to excite our admiration. The *Estufas* or chapels, for their worship of the sun in these buildings, were very large and

elaborately constructed. It is believed that they were so unwarlike as to have no offensive weapons. They probably burned the bodies of their dead. (See ARIZONA.)

The mineral wealth of Colorado does not consist alone in the amount of the precious metals contained in its broad mineral belt, though this will eventually be found, we think, greater than that of any other State, but includes also copper, lead, zinc, platina, tellurium, iron in vast quantities and of all kinds of ores, coal, gypsum, salt, kaolin, and pottery clays, etc., etc.

The coal of Colorado is worthy of special remark. It is widely distributed, being found and worked in Weld, Boulder, Jefferson, El Paso, Frémont, Huerfano, Las Animas, and La Plata counties, and is known also to exist in San Juan, Ouray, Gunnison and Summit counties. It is of very different qualities and of different geologic ages. In the north it is a lignite of the tertiary period, of very good quality. Toward the centre of the State it is a lignite of the cretaceous period, but of still better quality. In the south, in the vicinity of Trinidad, Las Animas county, the true coal measures have been reached, and the coal is a bituminous coking coal of great value. West of the Rocky Mountains, in La Plata county, it is from the true coal measures, semi-bituminous or semi-anthracite. Volcanic action in Las Animas and La Plata counties has probably affected the quality of the coals, much as it has in some parts of New Mexico, making, what would otherwise have been a soft, bituminous coal, a hard and dense anthracite. It is believed that the coal mines of Gunnison county, which are known to be anthracite, have been changed in the same way, but the quality is not inferior to that of Pennsylvania and a coking coal of the best quality. The area in this county is about 600 square miles, and the beds are from ten to fifty feet or more in thickness. There are two distinct beds, separated only by four feet of iron shale. Some of it is said to be a true anthracite of excellent quality, whether affected by volcanic action or not is not fully settled. The coal mines of Colorado will eventually be sufficient to supply the entire West.

Zoölogy.—The wild animals of Colorado are usually those of the plains, though there are a few not found in any considerable

numbers on the plains or elsewhere in the Rocky Mountains. The black and brown bear occur in considerable numbers both in Eastern and Western Colorado, and are hunted to some extent. The grizzly bear is not common even west of the Rocky Mountains, and is unknown in Eastern Colorado. He is a formidable customer in a close fight, but is easily frightened away by shouts or yells, when uninjured. The puma, cougar or panther is somewhat rare, except in the northwest of the State, but his congener, the jaguar, American or mountain lion, is found west of the Rocky Mountains, in the San Juan country, though his *habitat* has been generally supposed to be limited to Texas and Arizona. The gray or black wolf is found west of the Rocky Mountains, and, perhaps, east of them; the prairie wolf, usually, though perhaps incorrectly, called *coyote*, is frequent enough in Eastern Colorado, but not plenty in the west. The lynx, ocelot, wild cat, martin, fisher, and skunk are here, as elsewhere, in considerable numbers. The buffalo still frequents, though in greatly decreased numbers, the elevated plains of Eastern Colorado, but never appears in the mountains or west of them. His rare congener, the mountain or wood buffalo, is occasionally found, solitary, in the Rocky Mountains. The elk (*wapiti*), the finest game animal of the West, has been thus far very abundant in the West and especially in the great parks; but it has been so destructively hunted that its numbers are fast diminishing. The Virginia and mule-deer are numerous, and the antelope is found on the plains, while in the mountains the bighorn, or Rocky Mountain sheep and, more rarely, the Rocky Mountain goat, are plenty enough to make hunting of them rare sport. The smaller rodents and munchers, squirrels of many species, beavers, minks, muskrats, rats, mice, moles, gophers, marmots, rabbits, sage, and jackass hares, etc., etc., are, in the agricultural districts, more plentiful than desirable.

Birds, though not as numerous as in California, are yet abundant and of many genera and species. Of birds of prey, there are two, possibly three, species of the eagle, several of the vulture, and hawks and owls in abundance. In and around the lakes, in the parks and elsewhere, and on the plains, are a great

abundance of game birds, the wild goose migrating southward, ducks, brant, teal, and other water and marsh birds, including cranes, ibises and English and jack-snipe. The prairie-hens and other species of grouse, partridges, ptarmigan, quail, and, more rarely, the wild turkey and pheasant, are found in countless numbers on the plains and in the parks. In the mountains are many song birds.*

Reptiles are not very numerous nor formidable. There are lizards, horned toads and frogs, terrapins and turtles of the smaller kinds, one species of rattlesnake, and many harmless snakes.

Fish abound in the rivers and lakes, most of them edible. Trout are plentiful, and of large size in all the mountain streams, and grayling, black bass, pickerel, etc., are found in the lakes and larger streams. Many of the streams have been stocked with fish from the United States Fish Commission. The insect tribes, though numerous enough, are not as annoying as in some sections. Even the fly, which, in the West, accompanies civilization, has been known to the hunters in the Rocky Mountains less than ten years. The mosquito does not "pipe his soft note," nor present his formidable bill as ferociously as in Arkansas, nor are the other insect pests troublesome. The Rocky Mountain locust, rather contemptuously called "grass-hopper," and the ten-lined spearman, generally known as the "Colorado beetle" or potato-bug, are both popularly supposed to be natives of Colorado. We doubt whether the State is entitled to the honor or the reproach. Many circumstances seem

* Mr. S. Nugent Townshend, an eminent English sportsman and correspondent of *The Field* (London), thus speaks of some of the rarer game birds and animals he had shot in Northern Colorado:

"A few of the rare species we have seen in the Rockies, all of which are worth preserving, are the blue hares (white in winter); the gray-crowned finch, supposed to be the rarest bird in America, because he is always above timber-line, where few go to look for him; Clarke's crow, or the noisy chatterer, also living only at great altitudes; the pine grosbeak, also found only at high elevations, red in summer, in winter gray, with yellow head; long-crested jay, black head and crest, blue and black transverse, ribbed wings and tail; red-shafted woodpecker, rather rare and a beauty, body cuckoo-marked, with regular gray woodpecker head and breast, red under the wings. Great horned owls are, though handsome, very common, as is the towhee finch. The cross-bred foxes, between red and gray, are large, abundant, and very pretty when stuffed."

to indicate the origin of the latter from some part of the Great Basin, possibly in Western Utah; while the locust, according to its usual habit of making its original home in the desert, probably made its way into Colorado from the arid plains and mesas of Southern Utah and Southern Nevada, or possibly from Arizona. At all events, they have never proved as destructive to the crops in Colorado as they have in States farther east and northeast.

CHAPTER V.

NORTH AND SOUTH DAKOTA.

NORTH AND SOUTH DAKOTA as now constituted lie between the parallels of $42^{\circ} 30'$ and 49° north latitude, and between the meridians of $96^{\circ} 20'$ and 104 west longitude from Greenwich. There is also a small tract of about 2,000 square miles, lying between Montana, Idaho and Wyoming, of an irregular and partially triangular form, which was overlooked when Wyoming was organized, which belongs to Dakota, though no jurisdiction is exercised over it by the State, and it is at least 450 miles from its nearest boundary. This little tract is traversed by the Utah and Northern Railway, and includes a small slice of the Yellowstone Park. Dakota is bounded on the north by the Northwest British Territory and Manitoba, east by Minnesota and Iowa, south by Nebraska and the Missouri river, and west by Wyoming and Montana. Its area is 150,932 square miles, or 96,596,480 acres.

It is about 450 miles in length from north to south, and 350 miles from east to west.

The first settlements in the Territory were made in the south-east in 1859 in Yankton and vicinity, but were very few and scattering. It was first organized as a Territory in 1861, containing then a vast territory, which has since been reduced by the organization of other Territories till, in 1868, it was reduced to its present area. The Missouri river traverses the Territory from Fort Buford in the northwest to Sioux City in the south-east, and is navigable for the whole distance. Its largest affluent, the Yellowstone, enters it opposite Fort Buford, just as it enters the Territory. The Missouri receives eleven or twelve large tributaries on the south side, and about the same number on the north side, within the limits of the Territory. The Red river of the North rises in Lake Traverse (latitude 46°), and flowing due north forms the eastern boundary of the Territory for more than 200 miles to the boundaries of Manitoba, and enters Lake Winnipeg in the northern part of that province. The Red river has two large affluents, the Pembina and the Sheyenne, and several smaller ones. The Souris or Mouse river, a tributary of the Assiniboine, one of the Canadian rivers, drains the northwestern part of the Territory. The Minnesota river, a tributary of the Mississippi, has its source in Big Stone lake, and several of its affluents rise in Southeastern Dakota.

Of the tributaries of the Missouri in Dakota, the principal on the north side are the Big Sioux, and the Dakota or James. The latter is nearly 400 miles in length, a river of considerable volume, but is not navigable in any part of its course. On the south side of the Missouri, the principal affluents are: the Niobrara, which forms the boundary between Nebraska and Dakota for a considerable distance, and its tributary, the Keyapaha; the White river, the Big Cheyenne, with its north and south forks (the former bearing also the name of La Belle Fourche), the Owl river, the Grand river, and the north and south forks of the Cannonball river, the Heart river, the Big Knife river and the Little Missouri. The whole Territory is well watered.

Dakota has very many lakes, some of them, like Lakes Minne-

Waukan, Traverse, Big Stone, James, Kampeska, etc., of large size, and all of remarkable beauty.

Dakota was formerly divided into two or three distinct sections, and since the cession of the reservations of the Sioux and other Indian tribes a fourth has been added. Northeastern, or perhaps more properly Northern Dakota, extends across the State fifty miles or more on either side of the Northern Pacific Railway, from the Red River valley to the bounds of Montana. It is, for the most part, a very fine wheat region. The soil is rich, deep and easily tilled, and yields large crops of the cereals, and of potatoes and other root crops. Central Dakota, the new division, includes much of the former Sioux reservation. This is also good land for the cereals, for Indian corn, the root crops, and some portions of it for grazing. The third section, Southeast Dakota, is almost wholly farming land, and along the river valleys and the plains, which extend back from them, there is no better land anywhere on the continent. The so-called Bad Lands (*mauvaises terres*) of Southern Dakota are of much less extent than has generally been supposed. They are entirely in this section, and there are but 75,000 acres (about three townships in all) of them. There is said to be another small tract in the northwest, but not much is known of them. The adjacent lands, though not so good for farming, are yet superior for grazing; and the Bad Lands themselves yield at least an ample crop of fossils.*

The late Hon. William A. Howard, Governor of Dakota and previously Governor of Michigan, in his report to the Secretary of the Interior, under date of December 16th, 1878, thus described three of these sections:

"The Territory of Dakota is very large, being nearly 400 miles square, or more than four times as large as the State of Ohio. The settlements are principally confined to three distinct localities as remote from each other as possible, and of very difficult and expensive communication with each other.

*In these Bad Lands have been discovered some of the most remarkable fossils yet found in America. The whole region is the cemetery of the extinct monsters of the cretaceous and earlier geologic ages.

"The settlements of Southeastern Dakota, in which is located the present capital, extend from Northeastern Nebraska mainly in a northern direction up the Big Sioux, the Vermilion, and the James rivers. These settlements are extending north along the border of Northwestern Iowa and Southwestern Minnesota as far as Lake Kampeska, and as far west as the James river. Although the population is sparse at present it is rapidly filling up. Southeastern Dakota has a population at the present time of not less than 50,000, and probably 60,000.

"Northern Dakota is settled, or rather settling, along the west bank of the Red river of the North, from Richland county, opposite Breckinridge, down to Pembina, on the line of the British possessions, crossing the Northern Pacific Railroad at Fargo, and extending west along the line of that road to Bismarck. Population, perhaps 40,000.

"The other settlement is in the Black Hills, occupied mainly by a mining population, and containing a population at the present time of 10,000 at least, and probably 12,000.

"I suppose it is about 350 miles in a straight line from Yankton to Deadwood. But the only feasible way of getting there involves travel of at least 900 miles, and an expense greater than the journey from Yankton to Washington, and requiring more time to perform it. The distance from Yankton to Pembina as the 'crow flies' is at least 400 miles, and requires more time and expense than a visit to the capital of the nation.

"The three sections are not only remote from each other and of difficult access, but their interests are separate and not identical.

"In a commercial point of view, Saint Paul and Duluth are the objective points of Northern Dakota, while Chicago and Milwaukee will naturally drain Southeastern Dakota. Meanwhile the vast wealth of the Black Hills will swing to the right or left as it may best force itself out, or as railroad enterprise shall open a more direct way over which it may move. The great Indian reservation west of the Missouri river contains 56,000 square miles, about the size of all Michigan, including both peninsulas. Of course this will prevent settlement, and

tend to turn the business of the Black Hills to the south or north of itself."

At this time the treaty with the Sioux, which resulted in their relinquishing the greater part of their reservation in Central Dakota, had not been consummated, and that reservation was necessarily a barrier to any ready or easy communication with the Black Hills through Dakota.

Governor Howard added :

"The resources of this Territory are both agricultural and mineral, and of vast extent, only partially developed as yet; but enough has been done to demonstrate the fact that Dakota, considering her vast extent of territory, has agricultural resources scarcely second to those of any State in the Union. Dakota has on the east side of the Missouri river at least 60,000 square miles of land fit for the plow. It is believed that at least 15,000,000 bushels of wheat will be produced next year."*

* In an address delivered by Governor Howard at Yankton, before the Congregational Association, November 1st, 1879, he said, among other things :

"In 1858, when it was proposed to admit Minnesota to the Union as a State, it was strongly opposed on the ground that such a region could never sustain the permanent population of a State. It was said that when the fur trade was exhausted and some pine lumber cut, in a few years, the region would be abandoned as it could not sustain animal life, especially that of mankind. But look now, after only twenty years, at the great State of Minnesota with its thirty or forty millions of bushels of wheat, and filling up to its utmost borders with a thrifty population. Here now is Dakota Territory, nearly 400 miles square, and it has more acres of arable land than any State in the Union except possibly Texas. It is more than three times as large as New York and about four times the area of Ohio. It has met the same objections as Minnesota, and is now overcoming them in the same way. Lines of railroad are rapidly building across our rich plains, and new communities are forming on every hand. I was told that on that part of our eastern border between Eden and Big Stone lake there was for some time last summer an average of 300 teams and wagons per day entering Dakota. The same is true of Northern Dakota, where the marvellous growth of country and towns is a constant surprise. The Governor alluded to Fargo and its growth and to that of Grand Forks as about equal to it. He then touched upon the population, wealth and development of the Black Hills. He was there just after the fire at Deadwood, and spoke with eloquence and high respect for the sterling manhood and self-reliance of the people under that misfortune. He noted special instances of manly traits shown, of the fair play exhibited in respect to disputed titles where so much depended on possession. He described the great mines and the new discoveries and developments steadily progressing. His general summary of the advantages and resources of all Dakota was masterly and strong. He declared that we now had at least 150,000 population and many thought more. Of these one-third had come in the last eight months and one-half in eighteen months. The railroads are going forward, more people are coming, new centres of population are forming and the future is assured. The Governor then declared that if every church would quadruple its efforts in Dakota, it would only fairly fill the present needs of new forming communities. He

Hon. Henry Espersen, United States Surveyor-General of Dakota, in his report to the United States Land Office, in November, 1879, thus states the conditions of soil, climate, agriculture and minerals of the Territory :

"The soil of that portion of Dakota lying east of the Missouri river is generally a rich clay or sandy loam, very little rating below second-class. In the valleys of the Missouri, Big Sioux, Dakota, Vermilion, Cheyenne, Red river, and other streams, the soil is exceptionally rich, producing large crops of grain and grass. In this region there are no extensive areas of marsh or sand. The country is fairly watered by the streams named and their tributaries, and by numerous lakes in the northern and eastern portions. I have yet to hear of the point in the Territory where water cannot be had at a reasonable depth by digging. West of the Missouri river the character of the soil is not so fully determined, most of that section having been included in Indian reservations, but as far as known it is generally good. The district west of the Missouri river, prominently shown upon early maps as the 'bad lands,' might be compressed into a few townships. It may be said, in fact, that the proportion of waste land in the Territory, owing to the absence of swamps, mountain ranges, overflowed and sandy tracts, is less than in any other State or Territory in the Union. In the valleys and foot-hills of the Black Hills the soil is rich and productive, and the rainfall abundant the past season. It is expected that, in an agricultural way, that region will be self-sustaining without irrigation.

"Owing to the dryness of the atmosphere and general evenness of temperature, the climate of Dakota is very salubrious, and well adapted to agricultural pursuits. The average temperature of Southern Dakota may be compared to that of Southern Illinois, Northern Indiana, and Ohio. In the northern portions the winters are somewhat more severe. In the southern

hoped they would do so. Not only this church but all evangelical churches. He spoke of the importance of occupying strategic points, of doing this early and keeping up the communications like an army in its campaign. He alluded also to education and the munificent provision made by the United States for our future schools, declaring that if properly handled it would ultimately produce \$25,000,000. He called for such a public sentiment as would paralyze any sacrilegious hand that should wrongly touch that fund."

part early frosts are very rare and the weather very fine down to the first of November. Little snow falls in the winter, and sleighs are almost unknown.

"The agricultural products of the Territory include the whole range of those common to the Northern States. Small grains and vegetables grow in the greatest perfection. Northern Dakota, particularly the Red river valley, is destined to become one of the greatest wheat-producing regions in the country. No systematic effort has yet been made in pomology, but, from what has been done, there is no doubt that when the varieties best suited to the soil and climate are settled upon, fruit-growing will become a profitable occupation. At present, next to grain, stock-raising is the most growing industry. The excellent grasses and mild climate have given this occupation a great impetus, and within the past two years large sums have been invested in young stock.

"Deputy surveyors employed this season, west of Bismarck and near the line of the Northern Pacific Railroad, report coal croppings at various points near the Sweet Brier river, and between that and the Big Heart river. One vein in that vicinity is being worked to a limited extent, but the coal taken out so far, from near the surface, is of a somewhat inferior quality. Bituminous coal has also been found in the Black Hills, but the vein has not been sufficiently developed to determine its economic value.

"No metals have been found in any quantity outside of the Black Hills. In that district gold, silver, lead, and mica have been found in quantities of commercial value. A fine bed of the latter is now being worked.

"Of the gold and silver product, it can only be said in the limits of this report that it is steadily increasing. Daily more capital and refined methods are employed in the various mines now open, and new discoveries are constantly being made. The ease with which the auriferous ores are worked makes profitable the mining of very low-grade ores. There is said, by persons competent to judge, to be enough gold and silver ore 'in sight' in the Black Hills to employ the present mining facilities for the next ten years."

In his annual report to the Secretary of the Interior, bearing date September 13, 1879, Governor Howard used the following language:

"The mineral product of the Black Hills must be at least three millions of dollars for the year, and is rapidly increasing. A large number of stamps, for crushing the ore, and machinery of every kind, have been added, and it is believed the product of gold will be more than doubled the coming year. The mines are proving rich, and the systematic working of them is proving remunerative. The rapid development of the agricultural resources of the Black Hills and the large immigration going in and producing food in the vicinity of the mines, must lessen the cost of living and stimulate production and insure the reward of all classes of labor.

"Immigration this year has been large, far greater than in any former year, and this large increase extends to all parts of the settled portion of the Territory—perhaps about the same percentage of increase in each of the three divisions. Southeastern Dakota has had a very large increase of population. I am told by persons in whom I have confidence that as many as three hundred teams, immigrant wagons, have passed into the southeastern part of the Territory daily through the summer. Quite as large a percentage has come into Northern Dakota. The same may be said of the increase in the Black Hills. In the absence of census returns it is impossible to state with accuracy our present population. The swelling tide of immigration spread over so vast a territory, much of it in unorganized counties, makes satisfactory estimates difficult if not impossible. Well-informed persons have estimated our population at 160,000, others at 170,000, and some as high as 180,000. At the present time I think it is at least 150,000, probably more than that. The immigration to the Black Hills has been large and of a very satisfactory character. They claim to have, and I think with good reason, from 25,000 to 30,000 inhabitants.

"Railroad facilities are being largely increased in Dakota. We have of completed railroad in the Territory about 400 miles; this will be increased before January next to over 500

miles. Several strong corporations are pushing their trunk lines into this Territory at various places, as well to carry the products of our rich soil as ultimately to reach the Black Hills.

"It is but a short time since vast herds of buffalo roamed undisturbed over these prairies; now farms stocked with cattle and sheep everywhere abound. It is not long since we were taught in our Eastern homes, and in our schools, and learned from our geographies the story of the Bad Lands, the 'Great American Desert,' and were left to believe that Dakota for barrenness was only equalled by the Desert of Sahara, and whose chilling blasts were equal to the cold of Greenland; but since it has been demonstrated that Dakota has a soil exceedingly rich, has more arable and less waste land in proportion to its size than any State or Territory in the whole Union, and since millions of bushels of grain are already waiting transportation to the markets of the world, capital, proverbially timid, is stretching out its arms and with hooks of steel is drawing to itself the carrying trade of an empire.

"The interest our people take in education and the moral improvements is steadily increasing. Schools are increased in number and improved in character; churches are multiplied; greater respect for law than formerly is apparent. If we consider the richness and extent of our school lands, it will be found that Congress has provided for us a school fund that, when developed, will be equal to that of any State in the Union. If no sacrilegious hand shall be permitted to squander any portion of this rich inheritance, Dakota will have a population second to no State for intelligence and virtue."

It is due to these growing and enterprising young States that we should go somewhat more into detail in regard to the topography, soil, productions, and interests of the various sections of the two Dakotas. Through the courtesy and kindness of the State officials, particularly the Governor, as well as personal friends

whom he interested in the matter, we are enabled to lay before our readers a much more complete description of each section than has ever been published. We begin with Northern Dakota, and give a carefully written paper, prepared for the writer by Hon. James B. Power, of St. Paul, Minnesota, now the accomplished and thoroughly informed Land Commissioner of the Northern Pacific Railway. Mr. Power's opportunities of being fully informed in regard to Northern Dakota have been exceptional, and he has given our readers the full benefit of his researches.

"NORTHERN DAKOTA.

"The development of Northern Dakota in the past few years has been perfectly marvellous, and the vast plains which were once considered sterile and worthless have become populated with thousands of successful husbandmen whose labors on the soil, which is discovered to be as fertile as any in the world, add millions of dollars to the common wealth of the nation.

"The building of the Northern Pacific Railroad is, without doubt, the greatest project of the character ever undertaken, and it is, as a well-known writer recently said, 'of all the projected railroads to the western ocean, the one which must be of the greatest value and importance to the American people. It is the one which will open to settlement by far the most extensive, most fertile and in every way most desirable regions.'

"The practical history of Northern Dakota dates by the logic of events, from the advent of the railroad within its boundaries, as before that time the great plains had been almost unknown to man. Single trails extended in direct lines to the immense northern regions from whose forests came vast stores of valuable skins, and occasionally trappers and hunters made expeditions along the wooded streams which, with difficulty, find courses through the level land.

"Thousands of buffalo roamed at will, finding rich nourishment in the succulent grasses, and deer, elk and wolves aided in swelling the wild population of the region, and furnished game for the tribes of Indians who made frequent hunting sallies from the north and south. Explorers returned with discouraging

stories of the utter uselessness of the soil and the unfitness of the region for human habitation, so that it was looked upon as a great barren desert.

"The building of a railroad through such a waste was pronounced absurd, and the project of spending millions of dollars in laying a track through so extended an unproductive region, although a rich country might be reached farther west, was scoffed at, as the wildest extravagance.

"It was known that the immediate valley of the Red river was fertile, for, fully twenty-five years before, fine crops had been raised at a trading-post of the Hudson Bay Company, located twenty miles north, or down river, from the point at which the railroad now crosses.

"Several land companies had been formed about 1856, for the purpose of bringing the lands of the valley into market, but the panic of 1857 demoralized them. Of course but few of the original settlers remain on the land about the old trading-post, but one, who is now postmaster at Georgetown, twenty miles north of Fargo, has, for twenty-two years, cropped land plowed by the company, and he avers that it is still too rich.

"The railroad had done a great work in developing Northern Minnesota, but, when the operation of building was commenced in Dakota, much hesitation was displayed about undertaking the cultivation of the prairies beyond the Red River valley. Some far-seeing men, however, were satisfied that the soil was admirably adapted for wheat-raising, and, in 1875, the first experiment of importance was made and resulted so favorably that the great Bonanza Farms, such as the Dalrymple, were set in operation."

The following description of the territory, formed into North Dakota and South Dakota, November, 1889, is from the pen of the Hon. W. H. H. Beadle.

North Dakota contains 72,000 square miles, which is nearly all prairie. South Dakota contains 78,000 square miles. There are erroneous impressions concerning these States which are sometimes favorable, but more generally unfavorable to them. To arrive at a proper understanding, their general physical features are of

the first importance. In the first place but a very small part of it is mountainous, and this part is the Black Hills, which are hills, rather than mountains. Dakota does not lie among or upon the Rocky Mountains. If one will begin in New Mexico and follow along the Rocky Mountains, it will be found that they run nearly due north, through New Mexico, Colorado and into Wyoming, where they turn decidedly westward and then northwestward, leaving outlying lower ranges, spurs and hills to the north and northeast as far as the Black Hills. The traveler upon the Union Pacific Railroad observes this. He ascends along the Platte and the Lodge Pole to or a little beyond Cheyenne, and finds himself upon the elevated mountain plateaux; and thence westward he follows a mountain divide, from which the country is generally lower toward the Yellowstone and Missouri, and also southward toward the Bear, Grand and Green rivers, of the Colorado. He commences to descend into the Utah basin, and the mountain range goes north-northwest through Idaho and Montana (including part of Western Wyoming).

"Ascending the Missouri river from Omaha, the course is nearly north, to the southeast corner of Dakota, where it bends decidedly west for over 100 miles, and then north and northwest for 300 miles, where it turns westward and heads far toward the Pacific ocean, in the Rocky Mountains, the Yellowstone coming in from the west-southwest.

"These features, in physical geography, materially affect the character of the surface, soil, climate and agricultural products of Dakota. For instance, one would naturally expect that the heavy bend toward the west of the Missouri river would bear with it westward, the extent of fertile lands, etc., which are found in Eastern Nebraska. Then, too, the elevation above the sea at Yankton is only about 1,100 feet, but from this on the ascent is more and more rapid.

"The general elevation of the plains about the foot-hills around the Black Hills is from 2,500 to 3,000 feet, and this is the highest part of the Territory.

"No mountains lie to the north or northwest.

"The Continental valleys of the Mississippi (and Missouri) pass

on to those of the Red river of the North, the Saskatchewan and the McKenzie—to the Arctic ocean. These streams, or their tributaries, interlock in Minnesota and Dakota, and from St. Paul to the Missouri river westward or a little north of that, is the line of greatest elevation east of the Missouri river in Dakota, being 1,500 feet at highest points. It is a general plain or prairie, with few hills even, except the so-called 'co-teaus,' which are nine-tenths rich agricultural or grazing lands, and are not mountains at all; merely regions of land more elevated than the intervening great valleys.

"Most people understand what is meant by the 'Great Plains' of Nebraska, Kansas, Colorado, etc. They lie in an almost perfect inclined plain from the foot of the mountains eastward to the Missouri river, and, down this incline, the rivers are cut like grooves. The general surface is quite uniform. Take this example to understand Southern Dakota. It is composed of two such inclined plains upon a smaller plan. All that east of the Missouri river and up to about the forty-sixth parallel is a general inclined plane, sloping to the south, down and across which flow the Big Sioux, the Vermilion and the Dakota (or James) rivers, and the Missouri itself. The northern border is about 400 feet higher than the southern. That part of the south half of Dakota lying west of the Missouri is another *plane* inclined to the east—properly a part of the 'Great Plains' of the west extended up there. Its highest part is about 4,000 feet (mountains) and average lower part about 1,400 feet. Down across it flow the Keya Paha and Niobrara (near it in Nebraska), the White, Cheyenne, Moreau, Grand and Cannon Ball rivers. This region inclines more sharply, the streams are more swift, and the country is a little more rough than further south. The so-called Bad Lands occupy a small part only—not over 75,000 acres—which is not good grazing lands. We will now briefly refer again to each one of these regions.

"The western part has, especially in its southeastern quarter, and along the Missouri river, a fine body of agricultural lands, suited to wheat, rye, barley, oats and corn. As one passes west it becomes more suited to grazing, and is covered with a rich

growth of the best grasses—especially those which, curing upon the ground, afford winter grazing. This has been amply tried for many years by the herds kept by, and for feeding, the Indians. When we reach the valleys of the Cheyenne and Belle Fourche, the agricultural character again decidedly improves, and the plains between these streams and the Black Hills are being rapidly occupied as farms, stock-ranches, vegetable gardens, dairy farms, etc., as seems most profitable, to supply the people in the Hills with food. The valley of the Belle Fourche and its larger tributaries, is very delightful and fertile, one of the loveliest summer views in the West, wide, smooth and beautiful. The French called it ‘La Belle Fourche’—the beautiful branch—*i. e.*, of the Cheyenne. The Hills themselves are a real wonder-land. I have travelled through them and been in the principal mines. The examination changed my opinion. I look upon them as surpassingly rich in gold. They are peculiar—different from other gold regions. The same rule of expectation does not apply. They disappoint every one—but favorably. They are in *gold* somewhat as Leadville, Colorado, is in silver. Within five years everybody will recognize this, and within ten years that region will be a constant wonder in its gold product. I do not own a cent of interest there, directly or indirectly. Railroads will be there in two years or less, and then machinery, supplies and all conveniences will be cheaper, so that the mines can be opened and worked extensively, and it will become more than ever a wonder-land, because it *is* known, and not because it is *not* known.

“Southeastern Dakota has an area of 35,000 square miles, nearly every square foot of which is rich. It is generally well watered, has a deep dark prairie loam soil, mixed in places with a very small per cent. of sandy loam. It nearly all slopes slightly to the south and receives the spring rains and sunshine, making its seasons early and its soil warm to germinate the spring seed. Its great crops are wheat and corn, men being divided as to which is the more profitable of the two. Its third great interest is cattle-raising. These three represent about equally the resources of the farmers. As we go farther north, wheat domi-

nates, as the country is newer, and this crop can be more quickly turned. Farther south, corn equals wheat in importance, and in some counties stock-raising is chief. Take Yankton, Clay and Union counties, and during the last year they have sold about 2,000 head of cattle each, mainly ready for beef or to be fed temporarily in Iowa. They have sold about 3,000 head of hogs each, and about one and a-half million bushels of wheat. These are the three oldest counties.

"Southeastern Dakota has twenty-three organized counties, a population of 90,000 people, with 430 miles of railroad in operation—perhaps 460 nearly so. It will have 700 miles by November 1, 1880. It has an excellent advance in schools, churches and all social organizations. Its population is consolidated and continuous, and it is law-abiding and enterprising. Its villages and towns are marked by newspapers, church edifices and school-houses.

"The climate is warmer than would be expected. Its summer is long, and corn matures and fully ripens every year. In winter there are occasional stormy days, which are sometimes severe; but usually the winters are fair, sunny and dry. The United States Signal Service reports will show temperature for a series of years at Yankton and Fort Sully—fair tests, except that Sully is on the west edge of the best agricultural lands.

"Did you ever observe the disappointments that meet people who go by rail to California, Nevada and Utah in the hope of a cure for lung and other diseases? I have seen them come back suffering greatly. The trouble is, the too great and too sudden change from the more damp sea-coast and lake climates, to that very dry air. But the men of '49, the early overland immigrants and travellers to California, were celebrated for robust health. Their journey improved and cured weak lungs, bronchial, catarrhal, and like diseases. Why? They went slowly from one to the other. They travelled by horses or with oxen across Iowa, Nebraska, Dakota, Wyoming, etc. They took a long period of out-door summer life in this intermediate region. The same treatment will produce the same results now. The region of the Missouri valley in Dakota is the best in the world for such

summer travel and sojourn, and should be taken before the transfer even to Colorado, though that is better than California at first. I do not extend this idea. Its statement will be understood, as the history of the early days gave the best proof of its value."

We add, on the opposite page, the meteorology of the two stations of the Signal Service Bureau in Southeastern Dakota, and as Fort Sully station was changed to Deadwood in December, 1877, we have completed the year from the Deadwood report, the latitude being nearly the same, though the altitude of Deadwood is considerably higher. We give a later meteorological report from Deadwood and Lead City farther on.

We come next to the smallest, but, in some respects, the most important section of Dakota, the mineral region known as "The Black Hills." Let Mr. Zimri L. White, the accomplished and judicious correspondent of the New York *Tribune*, who visited and explored the Hills in the summer of 1879, describe for us the topography and history of the region. We may say in passing, that the Black Hills extend westward into Wyoming Territory, and are between the 43d and 45th parallels of latitude and the 103d and 105th meridians of longitude.

"The Black Hills, or Cheyenne Mountains, are a detached spur of the Rockies lying between the two forks of the Cheyenne river (one of the largest tributaries of the Missouri), whose confluence is near their eastern boundary. The North Cheyenne, or Belle Fourche, flowing from a point in Wyoming Territory west of and nearly opposite the centre of the Hills, bears off to the northeast and then to the southeast, forming a sort of an oxbow, while the South Cheyenne separates the Hills from the Southern plains. The area thus embraced is about 5,000 square miles, and may be divided into three parts—rugged mountains containing mineral veins and deposits, grass-covered foot-hills and prairies, capable of supporting enormous herds of cattle, and fertile valleys which, with or without irrigation, will produce all the grain, hay, potatoes and other vegetables that the future population of the Black Hills can consume.

"The mountains proper, as distinguished from the foot-hills,

cover about two-thirds of the area to which the name Black Hills applies. These are generally steep, covered with pine forests or the bare trunks of trees that have been killed by fires, and separated from each other by gulches and cañons through which small streams flow. These mountains are remarkably rich in minerals, although they have not been sufficiently explored to make it possible to estimate the value of their deposits. The gold mines are most developed, but there are silver mines rich enough, in promise, at least, to induce men who have capital and experience to purchase them and to invest their money in expensive mills for reducing the ores. Specimens of very rich copper ore have also been found, but I have heard of no mines being worked. Salt deposits have been uncovered, and machinery is now on the way to the Hills to enable the owner of one mine to try the experiment of manufacturing salt from the rock. Petroleum of excellent quality and in inexhaustible quantities has also been discovered, and many wells are already worked. Coal has been found in considerable quantities, and is now being tested in the gold mills near Deadwood. The gold mines exceed all others in value, and will probably continue to do so as long as there is mining in the Black Hills, but some of the other mineral deposits are of such character and promise as to invite capital and enterprise in their development.

“The foot-hills are covered with the richest and most nutritious grasses. Unlike the plains, where the grass-roots stand apart, leaving small spots of bare ground between them, the carpet is close and thick at the bottom, like the tame grass of a meadow in the East, and when cut shows a heavy swath, and cures either standing or as hay, retaining its bright, green color and its rich juices. These foot-hills, where the land is too dry for cultivation, and water for irrigation is not available, are excellently adapted for grazing. The grass furnishes good feed all winter, and the winds blow the snow off from the hills while it lies in the valleys, and the numerous cañons and bluffs afford shelter for the cattle during storms. No one now feeds or shelters his cattle in the winter; the value of individual animals that may die from exposure not being great enough to warrant

the extra expense of such care. At the same time I am inclined to think that in the end a little feeding and shelter would pay in the better condition the cattle would be in in the spring and the better prices that would be realized. It is estimated that there are now 100,000 head of cattle in the hills, but the grass seems hardly to have been touched. Stock-raising will eventually become one of the most important industries in the region.

"The arable lands of the Black Hills are from 500 to 600 square miles in extent, and consist of bottom lands along the streams and prairies and lower slopes of the foot-hills between the water-courses. The former generally need no artificial irrigation, but the latter require more water than the rains furnish and that is available in sufficient quantity in the brooks and creeks. The agricultural lands are of marvellous richness.

"The Black Hills were in the heart of the Sioux country until February, 1877, and were so jealously guarded by the Indians that white people who visited them did so at the peril of their lives. The Indians did not live in the Hills. They had a superstition that the Great Spirit never intended these mountains for the habitation of man. The terrific thunder storms which are frequent here, perhaps had something to do with this belief. They said that the Great Spirit had covered the Hills with trees to furnish the Indians with tepee poles, and filled the foot-hills with antelope and deer to supply him with food when the buffalo were scarce; and they frequently made excursions here, but never remained long. From one end of the Hills to the other, I am told, there are nowhere to be found the evidences of a long encampment of Indians. The Sioux have known of the existence of gold in the Black Hills for many years. A third of a century ago, it is said, they showed to Father De Smet, the Roman Catholic missionary, who spent his life amongst them, and in whom they had the most implicit confidence, large nuggets which they had picked up in the gulches. He warned them not to show these nuggets to white men, as it would arouse their cupidity and cause the Indians to be driven out of the country. Nevertheless, rumors of the mineral wealth of the Hills did get abroad, and evidences have been found that a few adventurers came here

in search of gold many years ago, and actually began to work the placers. They were probably all massacred by the Indians.*

"Several government expeditions were made into the Black Hills before that of General Custer, in the summer of 1874, and the report of each showed the presence of gold and other minerals. The first of these was that of Captain Bonneville, in 1834. General Harney came in here in 1855, and the highest peak in the Hills was named in his honor. Other expeditions led by Warren visited the Hills in 1856-'57, by Dr. Hayden in 1858-'59, and by General Sully in 1864. The dates of these visits I give on the authority of a resident of this city, as I have access to no records by which I can verify them. I have said that the explorations of each of these parties proved the presence of gold in these mountains; but no excitement was caused by their reports, because no one supposed that the precious metal existed here in sufficient quantities for profitable working. General Custer's expedition in 1874 is still remembered by most newspaper readers. The practical miners who accompanied him reported excellent 'prospects,' that is, that in washing out the gravel of the streams in pans they obtained gold in sufficient quantities to make it pay for working. The reports of these miners were received with incredulity in the East; and, during the winter of 1874-'75, the question was widely discussed whether there was gold in the Black Hills or not.

"So great was the public interest in the discoveries reported by those who accompanied General Custer that, in the summer of 1875, the Interior Department sent out an exploring expedition in charge of Professor Jenney, a young geologist. He came into the Hills with a train and escort, went pretty well over them, and made a map of the country. He discovered gold in many places, and more than confirmed Custer's reports of the previous year. Professor Jenney did not visit Deadwood and Whitewood gulches, the timber being so thick that he could not get to them with his train. But the adventurous placer-miners of the West did not wait for a scientific report upon the country,

* Mr. Robert E. Strahorn, in his "New West Illustrated," has traced the history of some of these parties who fell victims to their adventurous spirit. Some of them commenced operations in placer-mining as early as 1852.

but braving the hostility of the Indians and other dangers, they began to settle along the streams in the Hills in the summer of 1875, and to wash out the gold dust. The government forbade all persons to enter this country, and the President, I believe, issued a proclamation warning people against invading the territory that had been set apart for the Indians. But it is impossible to keep an old placer-miner out of gulches where there are 'pay streaks;' he will go through fire and water to reach new diggings. Hundreds of men came in here in spite of the proclamation and in spite of the orders to military commanders to arrest people found on the road or in the Hills. The soldiers even came to the Black Hills, and going up and down the gulches, gathered up the miners, confiscated their provisions, and took them to Fort Laramie or to the military posts on the Upper Missouri. But the adventurers came in here faster than the soldiers could take them out, and most of those arrested, even, as soon as they were released, as they all were when a military station was reached, came directly back if they had money enough to procure provisions. The government, having told the people through its exploring expeditions that there was gold in the Black Hills, could not keep them out without sending its whole army to guard the avenues of approach, and the policy of forcible removal was abandoned about the middle of November.

"The men who came to the Hills in 1875 and the following winter settled principally in the southern part, on Spring and French creeks. Custer City was the most important town, and Rockerville also became the centre of rich placer diggings. The mines in that region were all in the gulches, and during the first year considerable quantities of gold dust were taken out. I have not visited that region, but I have been told by a gentleman whose experience and scientific attainments cause one to have great confidence in him, that there are on Spring and French creeks the largest placer deposits in the world. He saw a man dig up a wagon-load of the gravel and haul it to a small creek where he washed out \$46 worth of gold from it. This deposit, this gentleman says, he has examined for a distance of fifteen

miles in length and twelve miles in width. It is not all as rich, by any means, as the wagon-load of which he spoke. Gold always runs in streaks, but the extent of it is very great. It is not now available for the want of water.

“When the discoveries of gold in Deadwood and Whitewood gulches, on the site of this city, and above and below it, were made, the first workings were very rich, and the fame of them soon attracted the people here from all parts of the Hills. Custer City was almost deserted, and for a year or so Deadwood was one of the liveliest mining camps in the country. But, although the placer-mines in these two gulches and their tributaries paid well for a time, the prosperity they brought was only temporary, and, if quartz mines had not been discovered and opened, Deadwood would now be a deserted village. Out of fifty placer claims, a dozen or so are now being worked, chiefly by Chinamen who pay to the owners fifty cents a day royalty for each man who works. By carefully washing over the tailings and the gravel which was left because it was ‘lean,’ these Chinamen are able to earn from \$1 to \$1.50 a day, and with that they are contented.

“The existence of veins of quartz in the hills above Deadwood was known to the early miners here, but none of them seem to have appreciated their value. When they ‘prospected’ them they showed only from \$2 to \$15 worth of gold to a ton of ore, and nobody seemed to think that ore of that grade would pay for mining and milling. And the first attempts to reduce the quartz here were failures pecuniarily, and none of them can be said to have been really profitable until the California capitalists came here, developed the mines, and began to take out and reduce the ore on a large scale.

“Very few valuable quartz gold mines, or mines which by sufficient development have been proved to be valuable, have yet been discovered outside of the great belt above this town. One or two mines which promise well are said to have been opened in the Rockford District, about twenty-five miles south of here. I shall visit that region and probably write a letter from there. A new mine has also been discovered near Custer

City, from which some astonishingly rich ore has been taken. The reduction of about 800 pounds of that ore, and the obtaining from it of gold at the rate of \$147 a ton, has caused considerable excitement in Deadwood.

"In closing this general description of the Black Hills, I may say that the country looks as though it had been settled ten years instead of three. In the mines it is difficult to realize the possibility of accomplishing as much as has been done in two years. The farms that are cultivated have already lost their appearance of newness, if they ever had it. Good roads have been built in every direction over and around the Hills, and travel is as safe upon them as upon a New England or New York turnpike. Two years ago (in 1877) camping equipage was a necessity for the traveller, now there are comfortable wayside inns every twenty-five miles, and frequently at shorter intervals. The game that abounded in the hills has disappeared, and civilization has already gained the mastery.

"The climate of the Black Hills is, on the whole, delightful. The elevation is sufficient (from 4,000 to 6,000 feet) to make the air pleasant without being too much rarefied for health or comfort. The midday sun is sometimes hot, but on no one of the past ten days (in the middle of July) has the heat been oppressive, and the nights are delightfully cool. I have slept under blankets every night since I came to Deadwood, and one or two evenings I found a light overcoat comfortable when going out upon the street. The winters here are rather long, the latitude being about that of St. Paul, Minnesota; but the towns are all situated in the cañons and surrounded by high mountains, which shield them from the cold winds and temper the rigor of the climate. During the last three years the summers have been long enough to ripen all kinds of grain and vegetables. During the first year after the settlement of Deadwood there was considerable sickness here, the prevailing disease being mountain fever. This was probably caused by digging up the gulches, the banks of which in many places were covered with a rank growth of vegetation. There is now probably no more healthful place in the United States than this city, and I know of few more comfortable ones in summer, if the climate alone is considered."

Sergeant J. O'Dowd, of the United States Signal Service at Deadwood, furnishes the following summary of the meteorology of that city for the year ending June 30th, 1879. The observations from July 1st to December, 1878, were taken at Lead City, two miles from Deadwood, and at several hundred feet higher altitude.

1878.	Mean Temperature.	Mean Humidity.	Highest Temperature.	Lowest Temperature.	Prevailing Wind.	Total rainfall, inches.	No. days rain or snow fell.
July	67.14	63.25	92	41	S.	5.77	16
August	65.85	62.80	85	46	S.	2.61	9
September	49.15	63.16	86	27	S.	2.06	8
October	39.58	60.50	72	6	N. W.	1.81	13
November	36.72	63.67	66	3	S.	0.75	3
December	18.26	72.47	54	—25	N.	3.63	11
1879.							
January	21.76	65.85	56	—24	S. W.	0.58	3
February	24.45	68.80	53	—12	S. W.	0.72	5
March	34.80	62.00	71	—5	S. W.	0.51	9
April	45.50	53.00	71	20	N. E.	7.69	8
May	53.80	63.20	81	29	N. E.	5.03	13
June	61.30	57.40	92	37	S.	4.67	18
Totals for year . . .	43.19	63.01	92	—25		35.83	116

It will be observed that the heaviest rainfall, 23.16 inches of the 35.83, of the year was in the months of April, May, June and July—the months in which the crops would be most benefited.

The mines of the Black Hills yield both gold and silver, though the silver deposits were not discovered till some time after active mining for gold had made the region widely known. The gold mines may be included in four classes: 1. Placers. 2. Quartz veins between slate walls. 3. Quartz veins between porphyry walls. 4. Cement deposits.

The placers in the Black Hills are of great extent, and some of them have yielded very large sums. Elsewhere in this work we have described the methods of placer mining, the use of the pan, the rocker, the Tom, the sluice and the hydraulic pipe, flume and sluice, and, as placer mining is much the same in the Black Hills as elsewhere, it is not necessary for us to repeat what we have said of these processes. Two points, however,

may be noticed: 1st. That dry placers or gulches—that is, beds of clay or gravel containing a considerable amount of free gold, but at such a distance from water having sufficient head to wash the gold, and consequently requiring that the dirt should be brought to the water, or the water to the placer at considerable cost—are not usually considered very profitable to work unless the amount of gold is large. In the Black Hills these dry placers or gulches have proved so rich that the dirt has been brought from some of them by wagon loads to the water, and where they were more extensive, it has been found profitable to construct ditches or flumes of several miles' length, to bring a mountain stream to supply the pipes for hydraulic mining. These placers seem to be distributed all over the hills. The first were discovered near the southern border, on Spring and French creeks, near the present sites of Custer City and Rockerville. Others still more profitable have been discovered near Deadwood; and nearly all the gulches between the two points, a distance of fifty or sixty miles, yield rich pay-dirt, and most of them are profitably worked. These placers are so rich, and there are so many of them yet undeveloped, that placer mining will probably be conducted with profit here for many years to come. But second, it is the natural law of placers, that after a period of time, which may be longer or shorter according to their extent and depth, and the thoroughness with which they are explored, they are worked out and become worthless. To the penniless miner they offer the chance of acquiring a fortune; but no man should buy into a placer mine, with the impression that he has a permanent property. It is good so long as it lasts, and how long that may be it is hard to say. A placer claim in the Black Hills extends 300 feet along the gulch, and from rim to rim.

“The second class of gold mines found in the Black Hills—quartz in slate, or between slate walls—is represented by the great ‘belt’ above Deadwood, on which the mammoth mines of the Hills are situated. The country rock, that is the rock of which the mountains are formed, is micaceous slate which has been thrown up at an angle of about 50°. Between the walls of this slate is a vein of brown quartz containing free gold in

small quantities, and separated from the country rock on each side by a layer of chloritic slate often containing more gold than the quartz itself. The vein is of enormous width—from 40 to 150 feet—but is frequently divided by ‘horses’ of slate, or large bodies of that substance extending into or across the vein. The rock in these ‘horses’ is sometimes rich enough to work, but generally is quite barren.

“There are two theories of the formation of these veins; and while there seems to be sufficient ore in all the large mines for present purposes, the future of these properties may depend in great degree upon which of these theories proves to be the correct one. The first is that advanced by Professor Jenney, the young geologist who was sent to explore the Black Hills in 1875 for the Interior Department, and who is now a resident of Deadwood. He holds that these ledges of gold-bearing rock are true fissure veins—‘interlaminated fissures,’ he calls them, that is, fissures opened between the layers of the slate rock, and not across the line of stratification. The auriferous quartz, he says, has been formed by the water solutions which have come up from below. He accounts for the ‘horses’ of slate in the vein by likening the cleaving of the rock to the splitting of a piece of oak wood. When a wedge is driven into it, particles of the wood cling from side to side across the opening made by the wedge. So, he thinks, when the rock was opened, bodies of slate extended across from one wall to the other, and remained in that position when the aqueous solution from below came up, surrounded them, and deposited the gold-bearing quartz. He explains the fact that the slate walls and horses contain gold by saying that the slate, which had minute spaces between its layers, soaked up the mineral-bearing fluid, which in some cases replaced the particles of slate. As a rule, the impregnation of the slate becomes less as the distance from the wall of the vein increases. Believing the veins to be true fissures, Professor Jenney supposes that they extend into the earth for an indefinite distance, and probably grow richer in their lower portions. Professor Jenney believes that after these veins were formed the ocean covered what are now the Black Hills, and that by its

action it tore down the surface, scattering fragments of the vein all over the country. Evidences of marine action are easily to be found in the vicinity of the mines.

"The other theory held by several geologists of much learning and experience is that the vein matter was precipitated from an aqueous solution that covered it. Their explanation and argument is this: The foot-wall of these veins is slate, a formation which everybody knows is of aqueous origin. The vein of quartz is deposited on this slate parallel with its line of stratification, just as one layer of rock is deposited on another. Above the vein we also find slate, and above that, where it has not been carried away by the action of the elements, a cement formation also of aqueous origin. These facts point conclusively to a horizontal deposit of the vein matter on a slate bed. The precipitant was probably oxide of iron, and it is therefore very natural that those ores containing the largest proportion of oxide of iron should be the richest in gold, as they are. After all these deposits had been made, the hills were gradually thrown up in their present forms under water.

"If the true fissure vein theory is correct (and it is the one most generally accepted by the most experienced miners), then there is reason to believe that the ore extends far into the bowels of the earth. And even if the theory of an aqueous deposit or precipitation is accepted, the fields over which these deposits took place may have been so great that when turned up upon their edges they may be practically inexhaustible. These quartz veins between slate strata seem to be, in many respects, the analogues of the 'contact lodes' of silver in Colorado, and may have had a similar origin.

"The quartz veins between porphyry walls have not been sufficiently developed to make it safe to give an opinion in regard to them. Some of the best mines of this class are situated in Strawberry gulch, about seven miles east of Deadwood, and in some of them considerable bodies of ore have been found. In another year, when a few mills shall have been erected near them for the purpose of working their ores, and development has been pushed further, more will be known of their value. It

is an interesting fact that they have already attracted the attention of the rich California miners and capitalists who have developed the great 'belt' above Deadwood, and that it is possible that they may purchase one of the most promising of them and see what it contains.

"In many of the placer mines, a little below the bed of the stream but considerably above bed rock, a layer of hard cement, consisting of sand, gravel, and boulders, and carrying free gold held together in one hard, conglomerate mass by oxide of iron, has been found. This substance has been a great obstacle to gulch miners on some claims. They had no means of crushing it to free the gold, and to remove it in order to get at the auriferous gravel beneath was very expensive. On the hill-tops, which have withstood best the action of the elements, similar cement deposits have also been found, varying from one and a-half to twelve and eighteen feet in thickness. Some of these are very rich in gold and others very lean. A number of mines have been opened on the cement beds and are now working successfully, while others have already worked out their pay ore. The rock is reduced in the same manner as quartz, by stamping and amalgamating. A cement deposit may be very valuable as long as it lasts, and may bring to its owners large profits, but its value depends entirely upon its extent and character. Like a placer (and it is, in fact, nothing but a solidified placer), it will some day be worked out and become worthless. Attempts have been made to sell these cement beds and the mines opened on them as true fissure veins, which they are not. Very possibly the ore 'prospects' and 'mills' as high as it is represented; but the wrong done to the proposed purchaser consists in giving the impression that it is a true fissure vein, when it is in reality only a solidified placer and may and probably will soon become exhausted."

The gold mines, aside from the placers and cement deposits, in the Black Hills, have been again classified by the mining men as those on the Bonanza Belt in the neighborhood of Deadwood, and those not on the belt. The mines on the belt which have attained the greatest reputation are the Father De Smet, the

Deadwood, the Golden Terra, the Highland, the Homestake, the Grant and the Old Abe mines. The Roderick Dhu and the Pierce are also believed to be on continuations of this belt. The belt is about two miles in length and from 100 to 200 feet in width.

The mines not on the belt, in the vicinity of Deadwood, are the Caledonia, which comprises four claims, and covers in all territory 1,500 feet long and 1,100 in width, though in two parcels. Several deposit mines are also included in this class, and a number of smaller mines. There are also new mines of great promise at Rockford, about twenty-five miles east of Deadwood, and at Custer City and Rockerville, in the southern part of the Black Hills.

The silver mining thus far has been mostly at Galena, on Bear Butte creek, about twelve miles east of Deadwood. There are other silver deposits, but these are the most promising. The ores are chiefly sulphurets and chlorides, mixed with quartz, oxide of iron and manganese, antimony and arsenic. There are some rich carbonates, but they do not appear in very large quantities; there are also some specimens of horn silver and a little free silver. The ores average from 30 to 150 ounces of silver to a ton, the low-grade ores being most abundant. The immense cost of transportation (\$40 a ton) has prevented the mining of low grade ores, and a small smelter, working imperfectly, has charged \$75 per ton for reduction. These difficulties will soon cease, as railroads, and larger and better smelters come in.

A large proportion of the gold veins produce an ore which elsewhere would be regarded as of low grade; many of them running at from \$9 or \$10 to \$13 or \$15 per ton. But they are so favorably situated, that they can be run by chutes directly into the mill, without being handled at all. The large mills of 120 stamps or more are also run at much less proportional expense than the smaller ones, while they do ten times as much work. Gold can be mined and milled at these mines and mills at from \$2 to \$5 per ton, and the mines are so situated that the expense is not likely to increase for a long time to come. While the grade of the ores is low, the quantity seems to be inexhausti-

ble, and the quality improves slightly as the depth increases. Thus it comes to pass that ores yielding from \$9 to \$15 per ton pay a better profit, as well as a steadier one, than ores of much richer grade, which are more difficult to mine, less easily milled and which must be carried to greater distances to be marketed successfully. Mr. White states the yield of the Black Hills mines in 1878 as \$3,500,000; in 1879 as about \$4,500,000, and in 1880 as probably \$6,000,000.

The Black Hills form the most elevated portion of Dakota, indeed the only portion which rises above 2,000 feet, or generally above 1,500 to 1,800 feet.

The following table gives the altitude of the principal summits and towns of this region, though some of the points named are in the Wyoming portion of the Hills:

Inyan Kara Peak	6,500	Harney's Peak	7,440
Bare Butte	4,800	Belle Fourche	3,734
Floral Valley	6,196	Castle Creek Valley	6,136
Crook's Monument	7,600	Dodge's Peak	7,300
Terry's Peak	7,200	Warren's Peak	6,900
Custer's Peak	6,750	Crow Peaks	6,200
Devil's Tower	5,100	Deadwood	4,425
Rapid City	3,175	Rockerville	4,125
Crook City	3,725	Pactola (estimated)	4,000
Rochford (estimated)	4,500	Custer City "	4,200

The present population of the cities and settlements of the Black Hills is hardly less than 30,000, and may exceed that. A year and a half since (in January or February, 1879), it was estimated at 18,000, and was probably divided very much as follows:

Deadwood	6,000	Rapid City	500
Golden Gate	700	Crook City	500
Lead City	2,500	Custer City	400
Rockerville	600	Spearfish City	250
Rochford	600	Hill City	200
Sturgis City	300	Galena	250
Sheridan	200	Pactola, Hayward and other	
Tigerville	200	settlements	2,500
Central City	2,000		
Gayville	800	Total	18,000

The Black Hills region is primarily, then, a mining region ; one which has been very largely taken possession of by capitalists, and its mining operations conducted on a scale which has been hardly equalled elsewhere in the West ; its stamp-mills aggregating more than 1,500 stamps, and these generally of the largest and most powerful character, and its gold production larger than in the same number of mines elsewhere. This character of the region will be likely to continue and increase, for years to come. But it would be a great mistake to suppose, as some have supposed, that the Black Hills must be dependent wholly or mainly upon other regions for its supplies of food, clothing or manufactures. The valleys and foot-hills, as well as much of the hill country itself, are covered to a great depth with an exceedingly rich soil, and its production of grains, root crops, and market garden vegetables and fruits will be ample ere long for the supply of the 50,000 or 75,000 people who will gather there. Those portions of the Hills and adjacent country which are not suited to mining or farming are admirably adapted to grazing, and even portions of the much berated "Bad Lands" are covered with rich and nutritious grasses. It is just the region for dairy-farming, and the mining towns will furnish a ready and profitable market for the milk, butter and cheese which can be produced. Sheep-farming will also prove profitable here, though perhaps the Cotswolds, Leicesters, Southdowns and Lincolns would pay better than the smaller wool sheep ; for the market for mutton will be close at hand, and the combing wools will bring as good prices as the felting wools, though for other purposes. We see no reason why this may not become *the* region for the production of the best quality of mutton.

The fine water-powers in the vicinity, and the coal mines which are readily accessible, as well as the large deposits of copper, lead and iron which are awaiting development, must ere long make it an important manufacturing region, and in a few years we may expect to see the immense quantities of mining and agricultural machinery which are needed, as well as all the manifold manufactures of wool and iron which are needed there, produced on the spot instead of being, as now, brought from Chi-

cago, the capital of a treeless region, across 800 or 1,000 miles of prairie, to a region of forest growths.

For so new a country, the educational and religious institutions of this as of other sections of Dakota are of a high order. Not Deadwood alone, but all the new towns of the Black Hills have excellent schools and good churches. For these the whole Territory is largely indebted to the active exertions and excellent influence of the late Governor Howard and his efficient coadjutors. The social condition of all parts of the Territory is greatly higher than that of most new settlements. Mr. White writes of the towns of the Black Hills: "Deadwood is a remarkably quiet, orderly, law-abiding town. This is the more remarkable when it is remembered that at the time it was first settled this was an Indian reservation, over which the Territorial authorities had no jurisdiction.

"The people who came here organized a temporary government of their own, the only sanction of which was common consent, but its laws were recognized and obeyed for about a year and a half. When the treaty with the Sioux was completed in February, 1877, opening the hills to settlement, the government that had been improvised was dissolved, but the Territorial officers did not arrive here until forty days later, and in the meantime there was not even the semblance of a government, and yet order was preserved.

"There are public gambling-houses in Deadwood, but they are not numerous, nor do they thrust themselves upon the attention of the stranger by open doors or bands of music. The gambling is almost without exception conducted in back and second-story rooms, and the proprietors of the houses are not apparently having a prosperous time of it. There is one variety theatre here, and although I have not attended one of its performances, its programme contains nothing that seems to be objectionable as variety shows go. Its performances close at a seasonable hour. There is also one dance-house on Main street. Of drinking-saloons there are of course an abundance.

"On the other hand, Deadwood is a city of homes. Small but tastefully built cottages are springing up by scores on all the

residence streets, and people who are in business here have brought their families. Any newcomer will find intelligent, refined, cultivated society here for himself and family. Religious organizations have been established, schools founded; and remote as the Black Hills are, and difficult of access, no one need hesitate to make his home here through fear that he will not find good society. Even the people who are seeking their fortunes in the remote gulches are by no means barbarians. Many of them are well educated, and are respected in the distant homes they have left, although they may now have to rough it and put up with many privations.

CHAPTER VI.

IDAHO.

IDAHO is one of the Central or Interior States or Territories of the northern tier, in form much like a huge chair. Its northern and very narrow boundary (at the top of the chair) is British America, while the seat of the chair is bounded on the north by Montana. The Bitter Root Mountains, one of the principal ranges of the Rocky Mountains, form the eastern boundary between Idaho and Montana, and between it and Wyoming the boundary follows the 111th meridian west from Greenwich. On the south, following the 42d parallel, it is bounded by Utah and Nevada; on the west it is bounded by Oregon and Washington Territory, the line being the 117th meridian to the mouth of the Boise river, thence along the Snake river for 350 miles to Lewiston, and thence northward along the 117th meridian to British America. The southwest corner of Yellowstone Park is within the bounds of Idaho. The Territory lies between the 42d and 49th parallels of north latitude, and between the 111th and 117th meridians of longitude west from Greenwich. It is about 410 miles long from north to south, and a little less than 300 miles wide at its widest portion. Its area as stated at the Land Office is 86,294 square miles, or 55,228,160 acres. There are very diverse estimates of the proportions of this area in arable, graz-

ing, timber and mining lands, and desert or worthless lands. Governor Brayman, with a somewhat imperfect acquaintance with the Territory, of which only one-eighth has yet been surveyed, makes the following estimate which those more familiar with the Territory regard as absurd: "An approximate estimate of the quality of these lands will afford, suitable for cultivation in their natural state, 15,000,000 acres; capable of reclamation by irrigation, 12,000,000 acres; grazing lands, 5,000,000 acres; timber lands, 10,000,000 acres; mining tracts, 8,000,000 acres; the 4,228,160 acres of desert are destitute of timber and minerals, and beyond the reach of irrigation. Large portions of the mining tracts bear timber also."

The Surveyor-General, Hon. W. P. Chandler, with a somewhat wider knowledge, writes at about the same time to the Land Office: "Any estimate of the number of acres of the various classes of land in this Territory, so broken in its surface and varied in its climate and altitude, can be only approximate. Of its total area of 55,228,160 acres, I believe 12,000,000 acres to be agricultural, either in its natural state or as it may be reclaimed by irrigation with the available water now flowing in the streams; 25,000,000 acres pasture lands; 10,000,000 acres timber lands; and the remainder, 8,228,160 acres, may be considered worthless, consisting of inaccessible mountain peaks and lava beds."

The surveyor-general would probably include the supposed 8,000,000 acres, or thereabout, of mining-lands in the 25,000,000 grazing and the 10,000,000 acres of timber lands. This last estimate is undoubtedly nearer the truth than the governor's, but in the amount of grazing lands which require always some water, it would seem to be somewhat excessive. A Territory whose average rainfall does not exceed twelve inches, and more than three-fourths of that in the winter and spring, leaving the entire summer and autumn parched and rainless, cannot well have more than one-fourth of its area arable land without irrigation. There are undoubtedly fertile valleys in Idaho, where with, and in some years, without irrigation, large crops can be raised, but these are the exception, not the rule. The Territory might become a moderately good grazing country, if its neighbors,

Montana, Wyoming, Oregon and Washington, were not so much better adapted to grazing.

It is primarily a mining country, and when the railroads now projected or in progress have given it access to a market at reasonable rates it may, if the Mormons and Indians will refrain from killing the immigrants, yield a large amount of the precious metals, and raise enough grain and root crops, beef and mutton to supply its own inhabitants, but there will be little of either to export, at least for some years to come.

Topography, Mountains, Lakes, Rivers, etc.—Idaho is a mountainous Territory, more so, perhaps, than any other of the States or Territories of "Our Western Empire," although there are no summits as lofty as those in Colorado, California, Oregon, Washington or Arizona. The altitudes range from 2,000 feet above the sea in the Snake River valley to nearly 10,000 feet at the summit of some of its loftiest peaks. Its general average of elevation is above 4,000 feet. On its northeast border from Lake Pend d'Oreille and Clark's fork of the Columbia river down to the Lewis or Snake river at the Wyoming boundary, the Bitter Root Mountains, one of the main ranges, though not the highest range, of the Rocky Mountains, separate it from Montana; almost parallel with these is an irregular range trending in general from northwest to southeast, known as the Salmon River Mountains, one of the outlying ranges of the Rocky Mountains. These traverse the central portion of the State. On the west, near the eastern bank of the Snake river, from the Weiser to the Salmon river, is a range of hills 5,000 or 6,000 feet in height. The southern part of the Territory, south of the Snake river, is an elevated plateau, and in the southwest an alkaline desert.

There are many valleys between these ranges of mountains and these elevated plateaux, some of them of considerable breadth and fertility; others broad but barren; others still narrow and fertile, and others yet mere rocky defiles and cañons. There are about twenty lakes of considerable size, and a great number of small lakes or ponds in the Territory. The largest are Lakes Pend d'Oreille, Cœur d'Alene and Kaniksu in the north, the Pay-

ette and Weiser lakes in the centre, Rocky, Bar, Market, De Lacy and Jackson's lakes in the east, and Bear lake in the southeast.

The whole of Idaho, except a very small tract in the southeast, belongs to the river system of the Columbia river and drains into the Pacific ocean. The exception is Bear river and lake in the southeast, the waters of which are discharged into the Great Salt lake. There is also a bare possibility that some one of the sources of the Green river, one of the constituents of the Colorado of the West, may rise in the mountains of the southeast, interlacing there with the sources of the Snake river or Lewis' fork. But more than 80,000 of the 86,000 square miles of the Territory are drained by the great tributaries of the Columbia and their affluents, and five-sixths of the 80,000 miles by the Lewis' fork or Snake river and its branches. The northeast corner is drained by the Kootenai, an affluent of the Columbia, which joins it in British Columbia, and the Pend d'Oreille or Clark's fork crosses the Territory a little above the forty-eighth parallel. The Spokane river, another of the tributaries of the Columbia, which flows through Lake Cœur d'Alene, drains a plateau thirty or forty miles in width, and below this the Snake river, the largest constituent of the Columbia, occupies the whole Territory. The Palouse, one of its principal affluents, in Washington Territory, drains a plateau south of the Spokane, and the Snake river itself, rising by several sources in Wyoming Territory, flows northwest, then southwest, west, northwest and north, having a course of about 1,100 miles in this Territory, receiving during its course between thirty and forty tributaries, some of them, like the Salmon, Boisé, Owyhee, Bruneau, Wood and Weiser, being themselves large rivers. The Salmon river drains the central part of the Territory. The Snake river, owing to its numerous falls and rapids, is not navigable in Idaho, but becomes navigable at Lewiston, the point where it leaves the Territory. At its headwaters, and for a considerable distance below, there are rich bottom lands, which, though 5,000 feet above the level of the sea, will, it is thought, prove productive. For 150 miles below these, it flows through a broad valley of moderately rich and fertile land. At or near the mouth of Bannack river it

enters a deep, rocky cañon, through which it passes for seventy-five miles. In this cañon are several very large falls, one of them the celebrated Shoshoné falls, exceeding Niagara in height (being 200 feet), and rivalling it in the volume of water and the grandeur of its surroundings.

Climate.—The meteorology of Idaho is somewhat meagre. The Signal Service Department has but one station in the Territory, that at Boisé City, and their deficiency has not been, so far as we are aware, made up by private observations. Boisé City is centrally situated, but its elevation is only 2,877 feet, and it gives but an indefinite idea of the temperature, rainfall, etc., of the more elevated tracts where nearly all the mines and many of the agricultural districts are situated. The following table and the appended note give all the particulars furnished by the Signal Service office:

METEOROLOGY OF BOISÉ CITY, IDAHO TERRITORY.

Latitude 43° 40'. Longitude 116° 6'. Elevation above sea-level 2,877 feet.

1877-1878. MONTHS.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Range of Temperature.	Mean Humidity.	Monthly and Annual Rainfall.	Monthly and Annual Mean Pressure.	Direction of Winds in the order of frequency.
1877.	°	°	°	°	per cent	in.	in.	
July	106	44	74.9	62	36.8	0.35	29.509	N. E., N., S. W.
August	98	43	73.9	55	33.3	0.09	29.572	N. E., S., N., N. W.
September	91	32	61.0	59	48.0	0.27	29.653	S., Calm, N. W., N., N. E.
October	74	21	49.0	53	57.1	0.85	29.792	S., Calm, W., N.
November	63	18	41.1	45	69.6	2.05	29.934	S., Calm, N. E., N.
December	54	8	30.9	46	67.9	0.01	30.074	Calm, W., N., S. W.
1878.								
January	55	7	34.3	48	66.2	1.73	30.081	S., Calm, W., N.
February	57	28	39.7	29	67.5	2.18	29.931	N. E., E., S., W., Calm.
March	75	26	48.0	49	62.0	1.63	29.997	S., Calm, W., N. E., E.
April	77	23	51.2	54	51.7	0.37	29.914	W., Calm, N. W., N., S. W., S.
May	86	29	58.8	57	49.9	1.18	29.961	N. W., N., N. E., W., S. E., E.
June	96	43	72.3	53	38.9	0.86	29.975	N. W., N. E., S., N. E.
Year	106	7	52.9	99	54.1	11.57	29.866	S., Calm, N., N. E., W., N. W.

The Signal Service Report for 1878-9 varies but very little from the above. The maximum temperature of the year was 103°, and the minimum 5°, the range, 98°, varying only one degree from the previous year, while the mean was 52.7°. The rainfall was for the autumn of 1878 1.10 inches; for the winter of 1878-9, 5.37 inches; for the spring of 1879, 4.38 inches, and for the summer of 1879, 1.46 inches, making 12.31 inches in all, or .74 of an inch more than the previous year. It is noticeable that 9.75 inches of this, or nearly four-fifths, fell in the winter and spring, and the proportion was about the same as the year before.

Geology and Mineralogy.—The geology of the Territory has been only partially investigated. The mountains, like the Rocky Mountains generally, are at their summits and on their western slopes, granitic or feldspathic, with, perhaps, some metamorphic rocks on their sides. The valleys are on their surface alluvial or diluvial—the result of the constant wear and erosion of the steep mountain slopes. Oftener perhaps than in other States and Territories, this débris from the mountains is a very fine dust—especially in the valleys of the Salmon and Snake rivers. The gold washed out of the veins or lodes in the mountains has been ground by attrition to the finest flour, so fine that although all the sand and the soil along those river valleys for many miles contain large quantities of it, it could not be separated by washing, and was only to be secured by running it very slowly over electro-plated silver plates, covered with mercury.

In the centre of the southern half of the Territory there is an extensive volcanic plateau, inaccessible and unexplored, destitute of soil or vegetation. The Bear river region, in Southeastern Idaho, as well as that bordering on the Yellowstone Park, is volcanic in its character. Among its minerals gold has been found in the fine impalpable powder already mentioned, in large grains and nuggets, and in gold veins and lodes along nearly the whole course of the Snake and Salmon rivers, in the Sawtooth or Salmon river range of mountains at almost all points, and at many points on the western slope of the Bitter Root mountains. On the east fork of Salmon river and about the sources, and indeed in nearly the whole length of Wood river and at the southern termination of the Sawtooth range, silver is very plentiful, and silver mining would be conducted with great success were the facilities of transportation of the rich ores less difficult.* Copper is found in very rich ores—sixty-five to seventy per cent., and also native copper of great purity in Bear Lake county, and in the

* This Wood river region, a district about eighty miles long and forty miles wide, is just now the scene of great excitement from the discovery of a number of rich silver lodes on both sides of Wood river. It is declared by some to be a second Leadville, and hundreds and perhaps thousands are flocking thither from Utah, Nevada, California and some from Northern Colorado. Whether they will come to stay remains to be seen.

Snake river copper mining district. It is also combined with silver in the Sawtooth range and the Wood river district.

Lead in the form of galena or sulphuret and carbonate of lead is found in all the silver mines, and an ore yielding about seventy-eight per cent. of pure lead is found in the Bear river. Iron is abundant and in all forms. Coal is found in great quantities and of excellent quality for coking and furnace purposes along Bear lake, and is also mined at Smith's fork and on Irvin creek. The Mammoth mine here shows a vein seventy feet thick of clear coal, and with adjacent veins, separated by thin veins of clay, will aggregate 200 feet in thickness. The Utah and Northern Railroad, which passes near, will soon open this great mine to a market. There is also a large bed of very good coal in Northern Idaho near Lewiston, and another in Boisé county, about twenty-five miles north of Boisé City. Antimony, arsenic and sulphur are found in considerable quantities, the latter especially in the volcanic districts. In Bear Lake county, near the Bear river, there is a sulphur lake very heavily encrusted with sulphur, and a mountain eighty-five per cent. of which is pure sulphur. The "Soda Springs," now becoming a popular resort from Salt Lake City, are in the same vicinity, near the Bear river and the Utah and Northern Railroad.

Mr. Robert E. Strahorn, who has recently explored this wonderful region which gives so many evidences of volcanic action, past and present, thus writes of it in the *New West Illustrated* of December.

"Soda Springs, a hamlet of probably one hundred souls, is located within a stone's throw of Bear river, near the latter's 'big bend' in Southeastern Idaho, and thirty-five miles east of Oneida Station, Utah and Northern Railway. It takes its name from a group of noteworthy springs in the vicinity, and thrives mainly upon the latter's fast-increasing popularity.

"One spring is graced with a lively steam vent which finds its way upward through a massive boulder. Frémont named it 'Steamboat Spring,' on account of its measured puff which resembles that of an engine. The waters of this spring are utilized in a comfortable bath-house near by. A group of four of the other

springs have attracted particular attention on account of the curative properties of the waters. The strongly mineralized fluid is also ever bubbling up from the depths of pretty basins in Bear river, in Soda creek, along the streets of the village—in fact, everywhere in the vicinity—and is as pleasant as a beverage, as it has been found exhilarating and strengthening as a tonic. Invalids with some of the most deep-set and loathsome blood diseases claim to have found a perfect cure in these fountains. A mile distant are other and not less interesting springs, the waters of which are so thoroughly charged with calcareous matter as to quickly form a coating of limestone upon any object immersed in them.

“‘V. de V.’ thus humorously writes of the great Hooper Spring: ‘Hooper Spring, one mile from the main town, is not surpassed in the world. Eight or ten springs all bubble up within a radius of ten or twelve feet, and all unite in one and flow off into Soda creek, in a stream six feet wide and four feet deep. This is the most powerful spring in the world. Its water is very highly charged. It is surprising how much people drink. Five pints is the usual draught; ten will blow a man up; and then, if you can find his mouth, twenty more will reunite the fragments, free him from disease and set him on his feet, regenerated and born again. The water from this spring is bottled and sold. It will when known become famous the world over. No mineral water I ever drank has such a delicious taste; none causes such an appetite. The men that drink it can’t do without it; children cry for it; old people renew their youth at this fountain.’

“The Octagon Spring has received some attention from Captain Hooper, who has a handsome summer villa near by, and in summer we find scores of visitors seated under the rustic shade, drinking the life-saving fluid from early morn until late at night. We meet here the lame, the halt, and even some that are nearly blind, all testifying to the wonderful benefits they derive from these waters. The mineral constituents of these springs render them the best of alteratives, and very efficacious in scrofulous and glandular difficulties, and for all diseases of the skin. They

are also an excellent diuretic, and contain enough iron to make them of value as a tonic. One quart of the water from the 'Octagon Spring' contains:

	Grains.
Sulphate of magnesia	12.10
Sulphate of lime	2.12
Carbonate of lime	3.86
Carbonate of magnesia	3.22
Chloride of calcium	1.33
Chloride of magnesium	1.12
Chloride of sodium	2.24
Vegetable matter . . . . .	.85

"There is sufficient carbonic acid gas to give the whole a power over disease. As a beverage these waters resemble in taste the famed Saratoga. A few minutes' walk away is a beautiful spring called the Ninety Per Cent. It is all soda save ten per cent. The water is delicious. It contains no iron.

"Four miles southeast of Soda Springs is Swan lake, one of the loveliest natural gems in the Wasatch chain. It reclines in an oval basin, whose rim is ten feet above the surrounding country. The shores are densely covered with trees, shrubs, and the luxuriant undergrowth native to that country. The outlet is a series of small moss-covered basins, symmetrically arranged, the clear water overflowing the banks, trickling into the nearest emerald tub, then successively into others, until it forms a sparkling stream and dances away to a confluence with the Bear river in the valley below.

"The rim is apparently formed by petrification, and extends down as far as the eye can penetrate the clear crystal water. Timber and bodies of trees coated with a calcareous substance can be seen in the depths, but no bottom has yet been reached in the centre, and it is supposed that it is fed by subterranean springs from the base of the mountain.

"Adjacent to this fit abode for water nymphs is the singular sulphur lake, out of whose centre liquid sulphur incessantly boils and coats the shores with thick deposits, looking as though it might be a direct out-cropping of Plutonian regions. Near by

is a mountain. eighty-five per cent. of which is pure sulphur. Mr. Williams is now hauling several tons of it to Oneida Station for shipment to Mr. G. Y. Wallace, of Salt Lake, who will experiment with it to ascertain whether it will pay to make it an article of commerce. The great sulphur deposit extends from the base of the mountain to an unknown depth, width and breadth. Remove the top crust anywhere near where it crops out and you find almost pure sulphur. The bed must be of immense area. You can load a wagon with your hands without pick or shovel as quickly as you could fill it with corn. You can take up a rock and touch a match to it and it will burn up, leaving a black substance which probably represents the impurity. A piece that weighs a pound will leave a lump of this about as large as a pea.

"Four miles from the village is the great ice cave, which a recent visitor describes as follows: 'This cave is situated very close to the roadside, on a level stretch of prairie about midway between the two crossings of the Bear river. We commenced the descent just as the heavens were reverberating with deep-rolling thunder and the rain pouring down in a perfectly reckless manner, thereby making us feel that it was an opportune time to shelter ourselves beneath the arching rocky cavern. Following our guide, we descended a rocky stairway some twenty feet to a level grassy rotunda some hundreds of feet in circumference, walled in by solid lava rocks. From this we descended still further over a rugged, rocky pathway, about twenty feet, when we found ourselves on the congealed floor of the immense ice cave, where ice can be found all the year round. While our guide was lighting our tallow dips, we surveyed the rocky walls which surrounded us. The roof, some ten feet above our heads, was filled with little niches or pockets, which had been utilized by cave swallows, while the side walls were as perpendicular and solid as though hewn by the hand of man out of solid rock. Coursing our way over the ice, which was apparently firm and solid for a distance of about 100 yards, we came to a huge pile of lava rock which had rolled from the roof and almost choked up the passage-way. Our guide bade us follow him, and we soon found ourselves once again in a clear open way, wide and

high enough to drive a six-horse stage-coach comfortably. This smooth tunnel we follow for probably 100 yards, when we again descend a rocky stairway, some ten feet or more, and stand upon what apparently was once the bed of a large river, with a perfectly solid sandy floor. The roof and side walls are here found to be covered with minute stalactites which, reflecting the light of our candles, lend a weird aspect to the surroundings. We now proceed onward several hundred feet through this perfectly symmetrical tunnel to the end, or what appears to be the end.'

"About two miles to the northwest of the ice cave is a slumbering volcano, out of which came part of the immense bodies of lava that cover this plain for miles around. The rim of the crater is almost circular, and stands up about 200 feet above the level of the plateau below. In the cooling process, the heart of the crater settled down about 100 feet below the rim, leaving a perfect representation to the student of nature of an immense extinct volcano. We have been able, during our short sojourn in this wonderland, to clearly trace nearly fifty immense extinct volcanoes, which appear, from the apparent age of the lava beds, to have been flowing about the same time.

"All kinds of game common to the western mountains can be found in the region surrounding Soda Springs. Bear, deer, elk, mountain lions, mountain sheep, sage hens, and ducks are especially plentiful. Trout fishing in Soda creek, Eight Mile creek, Bear river, and Blackfoot river, is of that character which can be appreciated even by the novice. Cast your hook in almost any of these waters, and prepare for a two or three pound trout as an almost instant result.

"The altitude of Soda Springs is 5,738 feet. The warmth of summer is tempered by the coolness of the nights. Blankets are not uncomfortable even in the warmest nights of August. The atmosphere is dry, like all mountainous regions, and is therefore very favorable to consumptives or those afflicted with pulmonary diseases. This was once the favorite resort of Brigham Young, and is still the regular summering place of numerous Salt Lake City merchants, who have built appropriate residences.

"Salt is also one of the Idaho minerals. The Salt Springs

which have been utilized since 1866, are in Oneida county, near the Wyoming border, about fifty miles northeast of the Soda Springs, on the Old Lander emigrant road leading from South Pass to Oregon. The road passes directly along the flat below the spring, where, before being concentrated in pipes, the water had spread out and, evaporating in the sun, formed large masses of salt crystals which attracted the attention of passers-by and led to the discovery of the spring flowing from the hillside above. It is clear and sparkling as the purest spring water, and never would be suspected of containing mineral. The valley in which it is situated is known now as Salt Spring valley, and is about ten miles long by an average of one mile wide; through it flows a rapid stream well filled with mountain trout.

"The Salt Springs were first taken up by B. F. White, Esq. (the present owner), and partner, in June, 1866, and works have since been in constant operation, every year witnessing an increase in the demand, until almost the entire stream flowing from the spring has been utilized. The salt is made by boiling the water in large galvanized iron pans, into which it is led by wooden pipes leading direct from the spring, thus insuring perfect cleanliness, and a uniformly white, clean and beautiful product. The water is kept constantly running into the boilers, and is kept at a boiling heat all the time. The salt is shoveled out once in every thirty minutes, and after draining twenty-five hours is thence thrown into the drying-house, there to remain until sacked and prepared for shipping. The most scrupulous cleanliness is observed in every operation, and when the immense banks of salt lie piled up in the drying-house, they resemble huge snow-banks more than anything one could imagine. It takes from two to four months for salt made in this manner to dry and ripen, and for this reason it becomes necessary to keep on hand a large supply, so that at any time a thousand tons of the purest and whitest salt in the world may be seen here in these far west 'Oneida salt works.'

"Following is an analysis of the Oneida salt, made by Dr. Piggot, the well-known analytical chemist, of Baltimore. It shows a higher percentage of pure salt than the celebrated Onondaga

brand, manufactured at Syracuse, while neither 'Liverpool,' 'Turk's Island' or 'Saginaw' salt approach it in purity, or are as white, clear or soluble in liquids:

Chloride of sodium (pure salt)	97.79
Sulph. soda	1.54
Chloride of calcium . . . . .	.67
Sulph. magnesia	Trace
Total	100.00

"In 1866 only 15,000 pounds of salt were here manufactured; but the demand in Idaho, Utah and Montana has so steadily increased that the product has averaged about 600,000 pounds per annum up to 1877. In 1878 it ran up to 1,500,000 pounds, and in 1879 to nearly 2,000,000 pounds, much of the production of the last two years having been consumed in Montana smelting works. It is sacked in 5, 10, 25, 50 and 100 pound bags, and is laid down at points 200 miles distant by wagon transportation at from three to four cents per pound."

Soil and Vegetable Productions.—We have already stated our conviction that the amount of arable land in Idaho did not greatly exceed one-fifth of its surface, even including those lands capable of successful irrigation. Of course in a Territory of which not one-seventh, including mining lands, has been surveyed, such a conviction must rest partly on general principles. Our reasons are these: The Rocky Mountains, which form the eastern boundary of the State present only their western face to it; and in the Rocky Mountains, the Sierra Nevada and other high mountain ranges on this continent having a general direction from north to south, the western face or slope is precipitous, and has very little arable land, though portions of the mountain below the snow-line may be covered with timber. But it is precisely these precipitous mountain sides which are oftenest the places of deposit of the precious metals. In Idaho we have not only the western face of the Rocky Mountains, but the long and bold spur of that range known as the Salmon River and Sawtooth Mountains, the latter name being given as characteristic of their precipitous faces. There is also a rocky wall overlooking the val-

ley of the Snake river for a long stretch of its course, and the deep, dark cañon through which it flows for seventy-five miles in the lava lands. There are furthermore the alkaline lands, a desert and dreary waste, the lofty *mesas* and plains, not irrigable, and unfit even for grazing without it, and the hillsides and foothills facing the east, which, though affording good pasture grounds in many instances for herds of cattle and flocks of sheep, are not adapted to cultivation. In short, it is only the river valley and bottom land, and not all of these, which can properly be called arable lands, and with an average rainfall of only twelve inches, more than three-fourths of it between November and April, even these must often, perhaps not always, be irrigated.

The soil, when irrigated, is generally fertile; perhaps not so rich as that of Montana, or California, or the Willamette valley, but it yields for a first crop from twenty-five to forty bushels of wheat, fifty bushels or thereabouts of barley, and fifty-five of oats. Corn does not do well, except in the river bottoms, the season being too short for it. Fruits are said to be raised with great success, especially in Northern Idaho.

The forest trees of Idaho are mainly those of the Pacific slope, but rather of Oregon and Washington, than of California. The various species of pine, including the piñon or nut pine, the *P. ponderosa* or yellow pine, and several other species of fir, spruce, tamarack and cypress, the red cedar, though not the "Redwood," the white cedar, the juniper, and some of the hardwood trees, as the oak of three or four species, chinquapin, hickory, etc., etc., are the principal trees of its forests. At full age, the pines, firs and cedars attain a height of about 150 feet. Like the Pacific States generally, it has very little sod, though the bunch grass is found on most of the grazing lands, and is so nutritious that cattle fatten upon it very readily. Wild flowers abound in the valleys, and many of them are of remarkable beauty. Lands upon which are found in luxuriant growth the bunch grass, larkspur and the wild sunflower of the Pacific coast, are well adapted to the growth of cereals, and these are the most common products of the plateaux of Northern Idaho. Wild fruits abound in Northern and Central Idaho, especially the wild

berries and wild cherries, though the wild cherry of the Pacific coast is a shrub, and not a tree. Its fruit is, however, more edible and pleasant than that of the East.

Zoölogy.—The wild animals of the Territory are, in general, those of Oregon and California. The grizzly bear is seldom seen, but has been found in the Territory. The black and cinnamon bear are common; the puma, cougar, panther or mountain lion (the beast is known by all four names) is troublesome, especially in the grazing lands; the gray wolf and the western coyote, all the fur-bearing animals, the martin, fisher, lynx, possibly the ocelot, the otter, mink, muskrat and beaver, as well as the smaller rodents; the marmot or gopher, sewellel and other species of mole are abundant. Moose (*Alces Americanus*) are found occasionally in Northern Idaho. Naturalists insist that the moose and true elk are identical; but the animal generally known as the elk or Wapiti (*Cervus Canadensis*) differs materially from the moose, and is the largest of the deer family in America; it roams over the whole Territory; two other species of deer are distinguished by the hunters; the bighorn or Rocky Mountain sheep is found in considerable numbers on the mountains and in the lofty valleys, and occasionally the Rocky Mountain goat or goat antelope is seen. The antelope of the plains is rare, if seen at all, west of the mountains, and the buffalo is not now, we believe, seen in this Territory, though said formerly to have been found here in vast herds. Of birds, there are considerable numbers, the *raptores* or birds of prey predominating, though the grouse, pheasant and ptarmigan families are abundant. Song-birds are not as abundant as in more southern climes. There are a few reptiles and serpents. The rivers and lakes abound with fish. Salmon trout, brook and lake trout and many other species of edible fish, among which the Red fish, found only in four lakes in the world, of which two are in Idaho,

CHAPTER VII.

THE INDIAN TERRITORY.

The Indian Territory is situated between the parallels of $33^{\circ} 35'$ and 37° north latitude, and between the meridians of $94^{\circ} 20'$ and 103° west longitude from Greenwich. The greater part of the Territory is between $94^{\circ} 20'$ and 100° west; but a narrow strip thirty-five miles in width, and extending from the 100th to the 103d degree of longitude, separates Northwestern Texas from Kansas and Colorado, and that strip watered by the Cimarron and Canadian rivers, forms a part of the Indian Territory. Its length from east to west along the northern border is 470 miles, and south of latitude $36^{\circ} 30'$, 310 miles. Its breadth east of the 100th meridian averages about 210 miles. Its area is now stated as 69,304 square miles, or 44,154,240 acres. It is bounded on the north by Kansas and Colorado; on the east by Missouri and Arkansas; on the south by Texas, from which it is separated as far west as the 100th meridian by the Red river; west of that meridian by the parallel of $36^{\circ} 30'$. Its western boundaries are Texas and New Mexico. Not quite one-thirteenth of its surface is in forests; the remainder is prairie, deep ravines, or wider valleys, and pleasant mountain slopes.

Besides a considerable portion still unassigned, the Territory contains eighteen or twenty Indian reservations. The Cherokees have two tracts: one of 5,960 square miles in the north-east, east of the 96th meridian, and bordering on Kansas and Arkansas. They also own a strip containing about 8,500 square miles, about fifty miles wide along the Kansas border from the Arkansas river, west to the 100th meridian. The Choctaw reservation, 10,450 square miles, is in the southeast, bordering on Arkansas and Texas. The Chickasaw reservation, 6,840 square miles, joins this on the west, and is separated from Texas by the Red river. The Creek reservation, 5,024 square miles, is in the eastern central part of the territory, between the Chero-

kees and Choctaws. The Seminole reservation, 312.5 square miles, lies southwest of the Creeks, and north of this that of the Sacs and Foxes, 756 square miles. A tract of 900 square miles, lying west of the Seminole reservation, is set apart for the citizen Pottawatomies and the Absentee Shawnees. West of the Cherokees' second reservation, and bounded north by Kansas, and southwest by the Arkansas river, is the Osage reservation of 2,345 square miles; and northwest of this is the little reservation of the Kaws, 156 square miles in extent. These are late comers, though not the latest, having been removed from Kansas in 1873. The Kiowas, Comanches and Apaches occupy a tract of 5,546 square miles in the southwest, bounded on the east by the Chickasaw reservation. North of these the Arapahoes and Cheyennes have a tract of 6,205 square miles. Fragments of ten tribes, viz.: the Quapaws, the Confederate Peorias, Kaskaskias, Weas, Piankashaws and Miamies, the Ottawas, the Shawnees, the Wyandots and the Senecas, severally, have reservations, aggregating in all 297 square miles, in the northeast corner of the Territory, east of the Neosho river. There are eight affiliated bands of Wichitas, Keechies, Wacoes, Tawacanies, Caddoes, Ionies, Delawares and Penetethka Comanches, who are gathered around an agency on the Washita river, west of the Creek country, but they have no reservation. The Modocs, the remnant of Captain Jack's band, and about 400 Kickapoos and Pottawatomies, were sent to the Indian Territory in 1873, and the Modocs were placed temporarily on the Shawnee reservation, and the latter settled on a tract on the Kansas border west of the Arkansas river. The Poncas and some bands of the Sioux were sent into the Territory in 1876 and 1877; some of the Arizona Indians about the same time, and some bands of Utes still later.

In 1878 the Indian office reported the whole number of Indians in the Indian Territory as 75,479. The increase by births, and the additional bands which have been sent in since that time, may have increased the total number to 78,000. These are for the most part recognized as civilized or partly civilized Indians. The greater part of them wear citizen's dress, and a fair propor-

tion have farms or herds of cattle or sheep and can read or write at least in their own language. This is especially true of the five leading tribes, the Cherokees, Choctaws, Creeks, Chickasaws, and Seminoles.

Surface, Mountains, Rivers, Lakes.—The surface of the Territory, like that of Kansas, at the north of it, has a general declination toward the East. In the southwest the Wichita Mountains attain to a moderate elevation, and in the east there is a continuation of the Ozark and Washita hills from Arkansas; beyond these the country spreads out into rolling prairie lands rising gradually to the west, and in the north there are table lands rising from 3,500 to 4,500 feet above the sea. The Territory is well watered. The Red river, which forms its southern boundary, receives numerous affluents great and small on its northern bank: the Arkansas, which is the principal river of the Territory, has for its largest tributaries the Canadian, the north fork of the Canadian, the Cimarron or Red fork, and the Little Arkansas, on its south bank, and the Neosho, Verdigris, and Illinois on the north, and is itself a mighty stream where it enters the Territory from Kansas. Owing to the falls which obstruct it, the Arkansas is only navigable in the Indian Territory as far as Fort Gibson, where the Missouri, Kansas, and Texas Railway crosses it. The Red river is navigable for nearly the whole distance along the southern border of the Territory. None of the tributaries of the Arkansas are navigable for any great distance, though several of them are large streams and afford permanent water power. The Territory is well watered, surpassing Kansas in that respect.

Climate.—The climate is generally mild and salubrious, but inclined to be dry in the northwest. In the southwest there are tracts of marshy lands where intermittent and remittent fevers prevail. The mean annual temperature in the southeast is 60°, in the northwest 55°. The annual rainfall, which, in the southeastern extremity of the Territory is fifty-two inches, decreases to thirty-five inches in the central region, and is less than twenty inches in the northwest corner.

Geology and Mineralogy.—The geology of the Territory has not been very thoroughly explored. It seems to partake more of the characteristics of Kansas than of Arkansas, and some of

its formations extend across the Red river into Northern Texas. Some of its mountains have azoic rocks near the surface, while in others, especially those of the central part of the Territory, the cretaceous period seems to have been predominant. There are in the west and northwest extensive deposits of gypsum, and in the Cherokee country are found coal, iron, good brick clay, marble of fine quality, and a yellow sandstone suitable for building purposes. It is probable that there is copper, and perhaps salt in the southwest, as the beds of copper ores come to the Red river in Wichita and Clay counties, Texas,* and there are salt springs in the same vicinity. Salt also abounds in the northwest of the Territory, and many of the springs and streams are very salt. There has been no search for the precious metals in the Territory, and their existence is not known with certainty.

The coal beds are an extension of the coal deposits of Missouri and Arkansas. At McAllister, in the Choctaw country, a mine is worked by a large force of white men, who pay a royalty to the Choctaw government; and near Muscogee, in the Creek Nation, is a fine mine of rich coal. All the coal mined in the Territory is bituminous, and of the best quality.

Soil and Vegetation.—The valleys of the Wichita range are fertile and have good timber, water and grass, and generally the region south of the Canadian river possesses a fertile soil and is well adapted alike to cultivation and grazing. There are extensive forests in the northeastern portion of the Territory, but about three-fifths of the Cherokee country is rocky, and only fit for grazing. Between the 97th and 98th meridians there is a narrow belt of timber called the "Cross Timbers," extending from the Cimarron, or Red fork of the Arkansas, to and beyond the Texas border. The region west of this and north of the Canadian river is reported to be sterile, without trees or much grass, with only a few sickly shrubs and cacti, and the soil covered with an alkaline or saline deposit. This land will produce nothing without irrigation, and may require also a plentiful application of gypsum, but with these measures it may yield abundant crops. The principal forest trees are the cottonwood, oak of several

* Copper has been discovered, but not mined, at several points in the Territory.

species, sycamore, elm, hickory, ash, yellow pine, osage orange or *bois d'arc*, pecan and hawthorn. Wild grapes of excellent flavor abound. The arable lands of the Territory are well adapted to cereal and root crops, and the yield per acre of wheat, Indian corn and oats is large. In the hilly and broken country the fruits of the temperate zone do well. Apples, peaches, pears, plums, cherries, and small fruits of good quality are largely raised.

Railroads, etc.—Aside from the river navigation, there is one railway which crosses the eastern portion of the Territory from north to south, viz.: the Missouri, Kansas and Texas Railway, extending from Sedalia, Missouri, to Denison, Texas, where it joins other Texas roads. The Atlantic and Pacific Railway, from Pacific; Missouri, also enters the Territory from the northeast, and forms a junction with the Missouri, Kansas and Texas at Vinita, in the extreme northeast of the Territory. This road, the Atlantic and Pacific, had projected a route crossing the Indian Territory from east to west along the valleys of the Cimarron and Canadian rivers, but in the strife of the different transcontinental routes and the difficulty of obtaining the right of way through the Territory, we believe this project has been given up.

The Character of the Population.—Rev. Timothy Hill, D. D., long a missionary in the Indian Territory, and thoroughly conversant with the tribes which occupy it, thus describes them in a communication to the *New York Evangelist* in the summer of 1880:

“The present population is about 80,000. I have conversed with a large number of men, native and long resident there, and none have placed it less than the number given, and some have placed it as high as 100,000. There can be but little doubt of 80,000. Without any claim to absolute accuracy, I place the population as Indians and people of Indian extraction about 62,000; colored, 8,000; and whites, 10,000. The Indians are well classified into civilized and uncivilized. In the former class come the Cherokees, Creeks, Seminoles, Choctaws, Chickasaws, a remnant of Delawares, who are Cherokee citizens; a part of the Shawnees, Pottawatomies, and Senecas. We shall gain in definite

impression if we consider each of these tribes and classes by themselves.

“Easily foremost are the Cherokees. They occupy the northeast portion of the Territory (except a limited portion in the extreme northeast corner), with only one district or county south of the Arkansas river. The Cherokee government has a population of about 18,000, but only some 12,000 of them are Indians, the remainder are colored and white. These people all live in houses, some of them large and well furnished. They live comfortably, and are slowly gaining property and increasing the comforts of life around them. The war stripped them bare, and they are now only regaining some of their lost property. The language of the Cherokees is extremely difficult to acquire; but a large number of them speak English, and no difficulty would be found in travelling nearly all over their country without an interpreter. But to reach the full bloods, an interpreter will frequently be needed.

“2. The Creeks occupy a region directly west of the Cherokees. They are a lower type of men, less attractive in personal appearance, less keen in intellect, than the Cherokees; but they are more industrious than the Cherokees, and are probably making more rapid advances in civilization. The Creeks are greatly intermingled with the blacks. The Creek government has probably a population of about 13,000, of whom some 2,000 are blacks.

“3. Next to the Creeks are the Seminoles, a separate tribe of the same general origin as the Creeks, and speaking nearly the same language, but with a separate government. They are much mingled with the blacks, but are gaining in civilization rapidly. The long contest which they kept up with the United States in Florida, sufficiently attests their courage and general skill.

“4. The Choctaws occupy the southeast portion of the Territory. I have been among them but little, and from personal observation cannot say much. They are the strongest in numbers of the civilized tribes, numbering about 16,000 Indians. They refused to give the blacks—their former slaves—citizenship, as

the Cherokees, Creeks and Seminoles did. They are less advanced in the arts of civilized life than the Cherokees, but are gaining steadily.

"5. The Chickasaws are a small tribe of the same general origin as the Choctaws, and speaking nearly the same language. They are, in some things, in advance of all the other civilized tribes, as their land is sectionized, although not yet allotted in severalty, as they cannot do that without consent of the Choctaws. There are many white men living among them, probably a larger number than any other tribe, many of them intermarried with the half-breeds, and thus citizens, and others living among them as renters of land, mechanics, or hired laborers, of the Indians or Indianized whites.

"6. Besides the five civilized tribes who have a separate government, there are others quite as much advanced as any Indians. There is a remnant of the Delawares, who are well advanced in all the arts of life. They are more quiet and orderly than any other Indians cultivating their land.

"Added to the Delawares are the Ottawas, not long since resident in Kansas—a quiet people, supporting themselves by cultivating their land. The Pottawatomies, a small tribe recently from Kansas, are partially civilized, some of them United States citizens.

"All these civilized tribes live in houses, dress like other people, and many of them speak the English language well. I never saw a blanket-Indian among any of these people; and perhaps the only peculiarity that would be noticed in the dress, is a fondness for bright colors with the women, and a disposition to place a feather or plume of some sort in the hat of the men. But a trader, who has lived among them many years, recently said to me, 'The change in the character of goods now sold is very marked. We sell fewer beads and trinkets and cheap jewelry, and we sell in the place of these a much better quality of cloth, and much more substantial goods for woman's wear. The advance in these things has been quite marked.'

"The uncivilized Indians are the remnants of a large number of tribes gathered from widely different regions, and greatly

differing in character. I suppose them to amount to about 12,000. These remnants differ greatly in personal appearance and prospective importance. The Osages, Nez Percés and Modocs are fine-looking people, fair size, well formed, and interesting in personal appearance—at least some of them. The Poncas are less interesting in appearance, and the Kaws and Quapaws are vile in character, and far gone in physical ruin, in consequence of the diseases of crime and vice. With most of these bands I have no intimate acquaintance, but I have seen the Modocs, Poncas and Nez Percés, and have been in the Quaker school of the Quapaws.

“In looking at the present condition of the Territory, the negro has a prominent place. The civilized Indians were all slaveholders before the war, and some of them held large numbers. In the reconstruction that followed the war, the Cherokees, Creeks and Seminoles admitted their former slaves to citizenship; but the Choctaws did not, and I think also the Chickasaws. These negroes are more industrious, as a class, than the Indians, and more thievish.

“The prejudices of the Cherokees against the blacks are as intense as any white man’s can well be, but the Creeks are much less prejudiced than the whites. I never saw a half-breed Cherokee and negro, but some of the most prominent families of the Creek and Seminole nations are of this mixed race, and it is not a very rare thing to find persons whose ancestry will be found in the three. A former politician of the Creek tribe, a man of honor and influence, possessed the general features and personal appearance of an Indian; but his African relationship was apparent in a woolly head, which he shaved, and covered with a wig of Indian hair.

“The white population is an element of great importance, and rapidly gaining in numbers and influence. This class consists of missionaries and teachers, and their families, aggregating quite a number; railroad employés, licensed traders, mechanics, and a large number who have intermarried in the Indian tribes. There is a large force of coal-miners at McAlister. The government officials are not numerous, but they are in positions where their

influence is strong, and in some instances extremely deleterious. The licensed traders are a numerous and influential body. The entire trade of all the Territory is in the hands of white men or half-breeds. I do not think a full-blood can be found behind a counter in all the Territory. These men remain long in the Territory, have their families there, and many of them intermarry with the educated half-breeds, and thus become citizens. From the contact I have had with this class of white men, I should place them higher in morals and influence for good than the average government officials. Another class of white men are scattered all over the Territory—those intermarried with the Indians. Many of them are respectable, honest and good men; but many others of them are abandoned men, outcasts from society. Wicked, corrupt and criminal, they become the teachers of crime and villainy, and the source of unmitigated evil to the Indians.

“A most important element in the estimate of this country, is the mixed race, commonly known as half-breeds. All persons who lay claim to any consanguinity with the Indians, are popularly designated half-breeds. This class is rapidly increasing, both by the frequent intermarriage of new-coming white men, and the raising of larger families by the native half-breeds than are usually seen among the full-bloods. It is said that in a given number of half-breed families, and an equal number of full-bloods, the children will be more numerous in the half-breed families. The number of births in the two classes of families would probably not be materially different, but a larger proportion of full-bloods will die in infancy and childhood. The full-blood father will take but little care of his babe, especially if it is sick; while the white or half-breed father will have more knowledge, and take better care of his child, so that the death-rate will be less. The half-breeds occupy the great majority of all the offices in the native governments; they are the law-makers and executive officers and teachers of the people. Some of them are well-educated gentlemen, and occasionally some of the young ladies possess a fair share of personal beauty.”

The Indian Title to this Territory.—At the first settlement of

this country by whites, they found the whole continent peopled, sparsely it is true, by tribes of Indians. They were of diverse origin, and were not themselves in all probability the original inhabitants of the land. Every year brings us new evidence that one or two, possibly three, races had preceded them in the occupation of this vast continent. Yet at that time they had the right of possession, and had held, at least by that title, much of it for some hundreds of years. The whites, coming in by hundreds of thousands, pushed the Indian tribes westward step by step, and gained possession of their lands—sometimes by conquest, oftener by treaty, and, perhaps, oftener still by purchase.

As a result of these various methods there were, in 1825, two centuries after the advent of the whites in what is now the United States, east of the Mississippi, only some small fragments of tribes in New England, New York and Pennsylvania, some larger but not hostile bands in Michigan and the Northwest Territory generally, a considerable body of Indians in Wisconsin Territory, and the partially civilized but resolute tribes of Cherokees, Choctaws, Chickasaws, Creeks and Seminoles in Northern Georgia, Alabama, Mississippi and Florida. These tribes had once or twice been at war with our people, and though they had been defeated after a long and vigorous struggle, their defeat was not an inglorious one. The first four tribes were no longer nomadic; they occupied their own farms and dwelling-houses, had their own churches and schools, and were in many respects as fully civilized as most of the whites around them. But the white people of these States had looked with envious and greedy eyes upon their lands, and were determined to drive them out and take possession. Some of the streams running through these lands were discovered to carry gold in moderate quantities; the land in these mountain farms was rich, and the careful culture of the Indians put to shame the slovenly farming of the whites; though there were millions of acres of government lands in these States to be had at nominal prices, yet they seemed poor by comparison with these Indian farms, and it was these that they wanted and must have. Added to this was the argument so decisive with a class of Southern people: "The

owners of these lands were nothing but Indians, anyhow; and therefore had no rights which a white man was bound to respect." The claim of the whites to these lands, it should be said in justice to the State of Georgia, had been anticipated as early as 1802; for in that year the United States government entered into a compact with that State, covenanting for certain considerations, that as soon as it could be done peaceably and on reasonable terms, the title of the Cherokee Indians to land within the limits of Georgia should be extinguished. It was not until the administration of President Monroe (1817-1825), that the State of Georgia became clamorous for the fulfilment of this covenant, and very soon thereafter the other States, Alabama, Mississippi and Tennessee, though they had no such compact with the United States, added their clamor to hers, demanding, under threats of forcible ouster, the prompt removal of these tribes from their limits. In consequence of their persistence President Monroe sent a message to Congress, we think in 1824, in which he submitted a proposition for the removal of all the Indian tribes from the lands then occupied by them within the several States, and organized Territories east of the Mississippi, to the country west of that river, *i. e.*, to Louisiana Territory. At that time neither Texas nor any part of the region west of the summits of the Rocky Mountain range, below latitude 42° north belonged to us. In that message President Monroe said, that "experience had demonstrated that in the present state of these Indian tribes it is impossible to incorporate them, in such masses, in any form whatever, into our system. It has been demonstrated with equal certainty, that without a timely anticipation of, and provision against the dangers to which they are exposed, under causes which it will be difficult if not impossible to control, their degradation and extermination will be inevitable. The great object to be accomplished is the removal of these tribes to the country designated, on conditions which shall be satisfactory to themselves and honorable to the United States. This can be done by conveying to each tribe a good title to an adequate portion of land to which it may consent to remove, and providing for it there a system of internal government which shall protect

its property from invasion, and by regular progress of improvement and civilization prevent that degeneracy, which has generally marked the transition from one to the other state." President Monroe in this message overlooked two things, viz., that the lands to which he proposed to move these tribes were already held by other tribes whose title to them was better than ours; and that in our onward progress as a nation the time might come, as it has within little more than half a century, when the new lands to which he proposed to remove them would be demanded by the whites, and efforts made to drive them to some other region. Congress was not ready to act, and the matter went over to the administration of President John Quincy Adams. In 1826 the Secretary of War made a full and exhaustive report, in which he suggested many difficulties in carrying out such a project as President Monroe had advocated, and expressed his fears, "that should the removal be made, it would not be effective, since it was probable the same propensity which had conducted the white population to the remote regions which the Indians now occupy, will continue to propel the tide of immigration, till it is arrested only by the distant shores of the Pacific."

Notwithstanding these apprehensions, the Secretary of War felt it necessary to submit a plan and prepare a bill for the consideration of Congress, providing for this removal. Among the provisions of this bill were: that the country to the west of the Mississippi, to which the tribes should be removed, should be set apart for the exclusive abode of the Indians; that they should be removed as individuals or families, and not as tribes; and if circumstances should justify it, the tribal relation should eventually be dissolved, and the Indians amalgamated in one common nation, with a distribution, of the property among the individuals.

The great difficulty, that the Indian from past experience could not be induced to trust our promises, must in some way be obviated. Notwithstanding the urgency of the Southern people and the excited and anxious condition of the Indian tribes, no action was taken until 1830, the second year of General Jackson's administration, when Congress passed a law authorizing the President to cause the territory west of the Mississippi, to which

the original title had been extinguished, and which was not included within the limits of any State or organized Territory, to be divided into a suitable number of districts for the reception of such tribes or nations of Indians as might choose to exchange the lands on which they then resided, and to remove West. The law authorized the President to solemnly assure the Indian tribes with whom the exchange was made, that *the United States would forever secure and guarantee to them and their heirs or successors, the country so exchanged with them.*

The President, in pursuance of this law, offered the most solemn guaranties, on the faith of the nation, to the tribes that might be willing to make the exchange, and offered them transportation and certain annuities as a further inducement. Under this offer the larger part of the Cherokees, Creeks, Choctaws, Chickasaws, and subsequently the Seminoles, Delawares, Shawnees, Miamis, Kickapoos, Pottawatomies, Chippewas of Roche de Bœuf, Sacs and Foxes, Wees, Piankashaws, Kaskaskias, Peorias, and other tribes, made the exchange, and were told that these lands should be their *permanent homes forever*. Except the tracts which were granted to the Cherokees, Creeks, Choctaws, Chickasaws, and Seminoles, the remainder of the transplanted tribes were allotted lands within the boundaries of the present State of Kansas. Since the organization of that State, all these emigrant tribes have, notwithstanding these solemn guaranties and pledges, been removed to the Indian Territory, and their permanent homes taken from them.

CHAPTER VIII.

IOWA.

IOWA, the name of one of the easternmost of the central belt of States and Territories composing "Our Western Empire," lying between the Mississippi and Missouri rivers. The name, which was that of a river within its bounds, and also of the Indian tribe which dwelt on the banks of that river, is said to mean, in the Indian tongue, "The Beautiful Land." The Indians who gave it and themselves this name were not the original inhabitants of this region, but migrated hither from the country of

the great lakes (perhaps Michigan) where they had borne the name of the Pau-hoo-chees, about 1690. They increased in numbers and power here till they became the most formidable of the Indian tribes of the Northwest except the Sioux, with whom they were constantly at war. That portion of the State lying on the Mississippi is supposed to have been visited by Father Hennepin in 1680, and it was probably in consequence of his explorations that the French government soon after took formal possession of it and erected two or three trading-posts along the river. Their occupation of the Territory was, however, of so trifling a character as not to excite the displeasure of the Iowa chief, Mau-hau-gaw, or his successors, Mahaska I. and II. Their power remained undiminished, though the French title to this as a part of the province of Louisiana had passed to Spain in 1763, returned to France in 1800, and been purchased as Louisiana Territory by the United States in 1803. In this long interval, two or three French families had settled in the Territory. Notable among these was Julian Dubuque, who, in 1788, settled on the banks of the Mississippi, and commenced trading and mining lead there. Eleven years later another Frenchman, Louis Honori, established himself as a trader at the head of the "rapids of the river Des Moines." But the power of the Iowas was beginning to wane. They had fought off their old enemies, the Sioux, and held possession of most of the Territory, but a new enemy now came upon them. The Sacs and Foxes, Illinois tribes, finding civilization pressing hard upon them, crossed the river about 1824, and began to make encroachments upon the hunting-grounds of the Iowas. Conflicts followed, and finally, about 1828, a fierce battle was fought between the invaders and the invaded near the present village of Iowaville, in Davis county, in which, after a long and terrible struggle, the Iowas were vanquished and the Sacs and Foxes occupied their hunting-grounds along the Mississippi. The Iowas moved sullenly westward, and finally crossed the Missouri. When the whites began to settle west of the Mississippi, in what was then the Territory of Missouri, in 1831 and 1832, the Sacs and Foxes were the occupants of all the eastern and southern portions of



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the Territory, while the warlike Sioux held undisputed possession of the northern portion, about the headwaters of the Des Moines and the lakes. At this time the Iowas, once so powerful and warlike a tribe, had been reduced, in their new home beyond the Missouri, by wars, whiskey and small-pox to about 1,300 souls.

After the close of the "Black Hawk War," in 1833, the power of the Sac chief, Black Hawk, waned, and his rival, Keokuk, who had favored peace with the whites, was recognized as the chief of the Sacs and Foxes. Black Hawk died in October, 1838, on the Des Moines river.

Let us now recapitulate its political or civil history, aside from any claim of Indian proprietorship, which in this case, as we have seen, was merely the right of the strongest.

1. It was first claimed by France in 1682 or 1683, by virtue of Hennepin's discovery.

2. In 1763, as a part of the province of Louisiana, it was ceded to Spain.

3. October 1, 1800, it was retroceded with the same boundaries by Spain to France.

4. April 30, 1803, France ceded the province of Louisiana to the United States.

5. October 31, 1803, a temporary government was authorized by Congress for the newly acquired Territory.

6. October 1, 1804, it was included in the "District of Louisiana," and placed under the jurisdiction of the territorial government of Indiana.

7. July 4, 1805, it was included as a part of the "Territory of Louisiana," then organized with a separate territorial government.

8. June 4, 1812, it was embraced in what was then made the "Territory of Missouri."

9. June 28, 1834, it became part of the "Territory of Michigan."

10. July 3, 1836, it was included as a part of the newly organized "Territory of Wisconsin."

11. June 12, 1838, it was included in, and constituted a part of the newly organized "Territory of Iowa."

12. December 28, 1846, it was admitted into the Union as a STATE.

Area and Extent.—Iowa is about 300 miles in length, east and west, and a little over 200 miles in breadth, north and south; having nearly the figure of a rectangular parallelogram. Its northern boundary is the parallel of $43^{\circ} 30'$, separating it from the State of Minnesota. Its southern limit is nearly on the line of $40^{\circ} 31'$ from the point where this parallel crosses the Des Moines river, westward. From this point to the southeast corner of the State, a distance of about thirty miles, the Des Moines river forms the boundary line between Iowa and Missouri. The two great rivers of the North American continent form the east and west boundaries, except that portion of the western boundary adjoining the Territory of Dakota. The Big Sioux river from its mouth, two miles above Sioux City, forms the western boundary up to the point where it intersects the parallel of $43^{\circ} 30'$. These limits embrace an area of 55,045 square miles; or, 35,228,800 acres. When it is understood that all this vast extent of surface, except that which is occupied by the rivers, lakes and peat-beds of the northern counties, is susceptible of the highest cultivation, some idea may be formed of the immense agricultural resources of the State. Iowa is nearly as large as England, and twice as large as Scotland; but when we consider the relative area of surface which may be made to yield to the wants of man, those countries of the Old World will bear no comparison with Iowa.

Surface.—The surface of the State is remarkably uniform, rising to nearly the same general altitude. There are no mountains, and yet but little of the surface is level or flat. The whole State presents a succession of gentle elevations and depressions, with some bold and picturesque bluffs along the principal streams. The western portion of the State is generally more elevated than the eastern, the northwestern part being the highest. Nature could not have provided a more perfect system of drainage, and at the same time leave the country so completely adapted to all the purposes of agriculture. Looking at the map of Iowa, we see two systems of streams or rivers running nearly at right

angles with each other. The streams which discharge their waters into the Mississippi flow from the northwest to the southeast, while those of the other system flow toward the southwest, and empty into the Missouri. The former drain about three-fourths of the State, and the latter the remaining one-fourth. The water-shed dividing the two systems of streams represents the highest portion of the State, and gradually descends as you follow its course from northwest to southeast. Low-water mark in the Missouri river at Council Bluffs is about 425 feet above low-water mark in the Mississippi at Davenport. At the crossing of the summit, or water-shed, 245 miles west of Davenport, the elevation is about 960 feet above the Mississippi. The Des Moines river at the city of Des Moines has an elevation of 227 feet above the Mississippi at Davenport, and is 198 feet lower than the Missouri at Council Bluffs. The elevation of the eastern border of the State at McGregor is about 624 feet above the level of the sea, while the highest elevation in the northwest portion of the State is about 1,400 feet above the level of the sea. In addition to the grand water-shed mentioned above, as dividing the waters of the Mississippi and Missouri, there are between the principal streams, elevations commonly called "divides," which are drained by numerous streams of a smaller size tributary to the rivers. The valleys along the streams have a deep, rich soil, but are scarcely more fertile than many portions of these undulating prairie "divides."

Rivers.—As stated above, the rivers of Iowa are divided into two systems or classes—those flowing into the Mississippi, and those flowing into the Missouri. The Mississippi, the largest river on the continent, and one of the largest in the world, washes the entire eastern border of the State, and is most of the year navigable for a large class of steamers. The only serious obstructions to steamers of the largest size are what are known as the Lower Rapids, just above the mouth of the Des Moines. The government of the United States has constructed a canal, or channel, around these rapids on the Iowa side of the river—a work which will prove of immense advantage to the commerce of Iowa for all time to come. The principal rivers which

flow through the interior of the State, east of the water-shed, are the Des Moines, Skunk, Iowa, Wapsipinicon, Maquoketa, Turkey and Upper Iowa. One of the largest rivers of the State is the Red Cedar, which rises in Minnesota, and flowing in a southeasterly direction, joins its waters with the Iowa river in Louisa county, only about thirty miles from its mouth, that portion below the junction retaining the name of Iowa river, although it is really the smaller stream.

The Des Moines is the largest interior river of the State, and rises in a group or chain of lakes in Minnesota, not far from the Iowa border. It really has its sources in two principal branches, called East and West Des Moines, which, after flowing about seventy miles through the northern portion of the State, converge to their junction in the southern part of Humboldt county. The Des Moines receives a number of large tributaries, among which are Raccoon and three rivers (North, South and Middle) on the west, and Boone river on the east. Raccoon (or 'Coon) rises in the vicinity of Storm lake, in Buena Vista county, and after receiving several tributaries, discharges its waters into the Des Moines river, within the limits of the city of Des Moines. This stream affords many excellent mill privileges, some of which have been improved. The Des Moines flows from northwest to southeast, not less than 300 miles through Iowa, and drains over 10,000 square miles of its territory. At an early day, steamboats at certain seasons of the year navigated this river as far up as the "Raccoon Forks," and a large grant of land was made by Congress to the State for the purpose of improving its navigation. The land was subsequently diverted to the construction of the Des Moines Valley Railroad. Before this diversion several dams were erected on the lower portion of the river, which afford a vast amount of hydraulic power to that part of the State.

The next river above the Des Moines is Skunk, which has its source in Hamilton county north of the centre of the State. It traverses a southeast course, having two principal branches—their aggregate length being about 450 miles. They drain about 8,000 square miles of territory, and afford many excellent mill sites.

The next is Iowa river, which rises in several branches among the lakes in Hancock and Winnebago counties, in the northern part of the State. Its great eastern branch is Red Cedar, having its source among the lakes in Minnesota. In size, Red Cedar is the second interior river of the State, and is of great importance as affording immense water-power. Shell Rock river is a tributary of Red Cedar, and is valuable to Northern Iowa, on account of its fine water-power. The aggregate length of Iowa and Red Cedar rivers is about 500 miles, and they drain about 12,000 square miles of territory.

The Wapsipinicon river rises in Minnesota, and flows in a southeasterly direction over 200 miles through Iowa, draining, with its branches, a belt of territory only about twelve miles wide. This stream is usually called "Wapsi" by the settlers, and is valuable as furnishing good water-power for machinery.

Maquoketa river, the next considerable tributary of the Mississippi, is about 160 miles long, and drains about 3,000 square miles of territory.

Turkey river is about 130 miles long, and drains some 2,000 square miles. It rises in Howard county, runs southeast, and empties into the Mississippi near the south line of Clayton county.

Upper Iowa river also rises in Howard county, flows nearly east, and empties into the Mississippi near the northeast corner of the State, passing through a narrow, but picturesque and beautiful valley. This portion of the State is somewhat broken, and the streams have cut their channels deeply into the rocks, so that in many places they are bordered by bluffs from 300 to 400 feet high. They flow rapidly, and furnish ample water-power at numerous points.

Having mentioned the rivers which drain the eastern three-fourths of the State, we will now cross the great "water-shed" to the Missouri and its tributaries.

The Missouri river, forming a little over two-thirds of the length of the western boundary line, is navigable for large-sized steamboats for a distance of 1,950 miles above the point (Sioux City) where it first touches the western border. It is, therefore,

a highway of no little importance to the commerce of Western Iowa. During the season of navigation last year, over fifty steamers ascended the river above Sioux City, most of which were laden with stores for the mining region above Fort Benton. We will now refer to the larger tributaries of the Missouri, which drain the western portion of Iowa.

The Big Sioux river forms about seventy miles of the western boundary of the State, its general course being nearly from north to south. It has several small tributaries, draining the counties of Plymouth, Sioux, Lyon, Osceola and O'Brien, in Northwestern Iowa. One of the most important of these is Rock river—a beautiful little stream running through the counties of Lyon and Sioux. It is supported by springs, and affords a volume of water sufficient for propelling machinery. Big Sioux river was once regarded as a navigable stream, and steamboats of a small size have on several occasions ascended it for some distance. It is not, however, now considered a safe stream for navigation. It empties into the Missouri about two miles above Sioux City, and some four miles below the northwest corner of Woodbury county. It drains about 1,000 square miles of Iowa territory.

Just below Sioux City, Floyd river empties into the Missouri. It is a small stream, but flows through a rich and beautiful valley. Its length is about 100 miles, and it drains nearly 1,500 square miles of territory. Several mills have been erected on this stream, and there are other mill sites which will doubtless be improved in due time.

Little Sioux river is one of the most important streams of Northwestern Iowa. It rises in the vicinity of Spirit and Okoboji lakes, near the Minnesota line, and meanders through various counties a distance of nearly 300 miles to its confluence with the Missouri near the northwest corner of Harrison county. With its tributaries it drains not less than 5,000 square miles. Several small mills have been erected on this stream, and others doubtless will be when needed.

Boyer river is the next stream of considerable size below the Little Sioux. It rises in Sac county and flows southwest to the Missouri in Pottawotamie county. Its entire length is about

150 miles, and drains not less than 2,000 square miles of territory. It is a small stream, meandering through a rich and lovely valley. The Chicago and Northwestern Railroad passes down this valley some sixty miles.

Going down the Missouri, and passing several small streams, which have not been dignified with the name of rivers, we come to the Nishnabotna, which empties into the Missouri some twenty miles below the southwest corner of our State. It has three principal branches, with an aggregate length of 350 miles. These streams drain about 5,000 square miles of Southwestern Iowa. They flow through valleys of unsurpassed beauty and fertility, and furnish good water-power at various points, though in this respect they are not equal to the streams in the northeastern portion of the State.

The southern portion of the State is drained by several streams that flow into the Missouri river, in the State of Missouri. The most important of these are Chariton, Grand, Platte, One Hundred and Two, and the three Nodaways—East, West and Middle. All of these afford water-power for machinery, and present splendid valleys of rich farming lands.

We have above only mentioned the streams that have been designated as rivers, but there are many other streams of great importance and value to different portions of the State, draining the country, furnishing mill-sites, and adding to the variety and beauty of the scenery. So admirable is the natural drainage of almost the entire State, that the farmer who has not a stream of living water on his premises is an exception to the general rule.

Lakes.—In some of the northern counties of Iowa there are many small, but beautiful lakes, some of which we will notice. They are a part of the system of lakes extending far northward into Minnesota, and most of them present many interesting features which the limits of our sketch will not permit us to give in detail. The following are among the most noted of the lakes of Northern Iowa: Clear lake, in Cerro Gordo county; Rice lake, Silver lake, and Bright's lake, in Worth county; Crystal lake, Eagle lake, Lake Edward, and Twin lakes, in Hancock county;

Owl lake, in Humboldt county; Lake Gertrude, Lake Cornelia, Elm lake, and Wall lake, in Wright county; Lake Caro, in Hamilton county; Twin lakes, in Calhoun county; Wall lake, in Sac county; Swan lake, in Emmet county; Storm lake, in Buena Vista county; and Okoboji and Spirit lakes, in Dickinson county. Nearly all of these are deep and clear, abounding in many excellent varieties of fish, which are caught abundantly by the settlers at all proper seasons of the year. The name "Wall Lake," applied to several of these bodies of water, is derived from the fact that a line or ridge of boulders extends around them, giving them somewhat the appearance of having been walled. Most of them exhibit the same appearance in this respect to a greater or less extent. Lake Okoboji, Spirit lake, Storm lake, and Clear lake are the largest of the Northern Iowa lakes. All of them, except Storm lake, have fine bodies of timber on their borders. Lake Okoboji is about fifteen miles long, and from a quarter of a mile to two miles wide. Spirit lake, just north of it, embraces about ten square miles, the northern border extending to the Minnesota line. Storm lake is in size about three miles east and west by two north and south. Clear lake is about seven miles long by two miles wide. The dry rolling land usually extends up to the borders of these lakes, making them delightful resorts for excursion or fishing parties, and they are now attracting attention as places of resort, on account of the beauty of their natural scenery, as well as the inducements which they afford to hunting and fishing parties.

Prairie and Timber.—One of the peculiar features of the topography of the northwest is the predominance of *prairies*. It has been estimated that about nine-tenths of the surface of Iowa is prairie. The timber is generally found in heavy bodies skirting the streams and lakes, but there are also many isolated groves standing, like islands in the sea, far out on the prairies. The eastern half of the State contains a larger proportion of timber than the western. The following are the leading varieties of timber: White, black, and burr oak, black walnut, of excellent quality, but now almost entirely picked out and shipped to England, butternut, hickory, hard and soft maple, cherry, red

and white elm, ash, linn, hackberry, birch, honey locust, cottonwood, and quaking asp. A few sycamore trees are found in certain localities along the streams. Groves of red cedar also prevail, especially along Iowa and Cedar rivers, and a few isolated pine trees are scattered along the bluffs of some of the streams in the northern part of the State.

The great demand for timber for railroad construction, for ties, stations, bridges, and for a time for fuel, as well as for dwellings, telegraph poles, for agricultural and mining machinery, and mine supports, has within the last decade nearly stripped Iowa of its most valuable timber; and the English movement for culling out all her valuable black walnut trees, working them up roughly by portable saw-mills, and shipping the timber at once, is likely to deprive the country of one of its best sources of supply of this valuable wood.

Nearly all kinds of timber common to Iowa have been found to grow rapidly when transplanted upon the prairies, or when propagated from the planting of seeds. Only a few years and a little expense are required for the settler to raise a grove sufficient to afford him a supply of fuel. The kinds most easily propagated, and of rapid growth, are cottonwood, maple, and walnut. All our prairie soils are adapted to their growth. Tree-planting is encouraged by national and State laws, and is now actively practised, but it will be long before these trees will, either in quality or quantity, supply the loss of those which have been so recklessly sacrificed.

Geology and Mineralogy.—The surface geology of Iowa, like that of Nebraska and partly of Kansas, is peculiar and very interesting from its relation to the soil of the State. Far back in the glacial period this whole region, including Iowa, South-eastern Dakota, Nebraska, and Eastern Kansas, was less elevated than it now is, and formed the bed of a vast lake at least 500 miles in length and nearly that in width. Through this lake flowed the Missouri, which had then received its greatest affluent, the Yellowstone. Its other principal tributaries at that time flowed into the lake. For ages numerous streams brought into the lake the *débris* of mountain and hill, and the glaciers added

their contribution from their moraines. At length there came a time of upheaval; this vast lake was drained till it became an immense marsh of soft and plastic mud; through this the rivers ploughed their way, cutting through the deposits of gravel, of silica, and of decayed vegetation easily, and left on either side high bluffs, which, however, having no rocky bond of union, often crumbled and fell into the streams. After another long period the marsh became dry land, and its surface, composed of drift or gravel, loess or bluff deposit, a very fine and rich silicious powder, and alluvium as the result of decayed vegetation, furnished the finest soil in the world. But beneath this surface, which is of varying, though everywhere of considerable thickness, the rivers, which have plowed their way through its lowest layers, reveal other important and economically valuable strata. The cretaceous beds underlie this vast alluvial and diluvial deposit, and below them we come to the coal measures of the carboniferous era, whose existence was first discovered from their outcrop in the river bluffs.

“The coal of Iowa is bituminous, and is a true coal, not a lignite. It covers an area of at least 20,000 square miles, and coal is successfully mined in more than thirty counties of the State. It is not of identical quality in all parts of the coal field, but that produced in Appanoose, Boone, Davis, Dallas, Hamilton, Hardin, Jefferson, Mahaska, Marion, Monroe, Polk, Van Buren, Wapello, Webster, and perhaps some other counties, is of excellent quality and easily raised.

“The great productive coal field of Iowa is embraced chiefly within the valley of the Des Moines river and its tributaries, extending up the valley from Lee county nearly to the north line of Webster county. Within the coal field embraced by this valley deep mining is nowhere necessary. The Des Moines and its larger tributaries have generally cut their channels down through all the coal measure strata.

“The coal of Iowa is equal in quality and value to coal of the same class in other parts of the world. The veins which have so far been worked are from three to eight feet in thickness, but it is not necessary to dig from one thousand to two thousand feet

to reach the coal, as miners are obliged to do in some countries. But little coal has in this State been raised from a depth greater than one hundred feet.

"Professor Gustavus Hinrich, of the State University, who also officiated as State Chemist in the prosecution of the State geological survey, gives an analysis showing the comparative value of Iowa coal with that of other countries. The following is from a table prepared by him—100 representing the combustible :

NAME AND LOCALITY.	Carbon.	Bitumen.	Ashes.	Moisture.	Equivalent.	Value.
Brown coal, from Arbesan, Bohemia . . .	36	64	3	11	114	88
Brown coal, from Bilin, Bohemia . . .	40	67	16	00	123	81
Bituminous coal, from Bentheu, Silesia . .	51	49	21	5	126	80
Cannel coal, from Wigan, England . . .	61	39	10	3	113	87
Anthracite, from Pennsylvania . . .	94	6	2	2	104	96
Iowa coals—average . . .	50	50	5	5	110	90

"In this table the excess of the equivalent above 100, expresses the amount of impurities (ashes and moisture) in the coal. The analysis shows that the average Iowa coals contain only ten parts of impurities for one part of combustible (carbon and bitumen) being the purest of all the samples analyzed except the anthracite from Pennsylvania.

"Many years ago (in 1868) the production of this coal in Iowa was reported as 241,453 tons, or more than six million bushels. It has increased steadily since that time, and in 1877 had reached over 1,500,000 tons, or about forty million bushels. It is still increasing, and is used in several of the adjacent States.

"*Peat.*—During the last thirteen or fourteen years large deposits of peat, existing in several of the northern counties of the State, have attracted considerable attention. In 1866, Dr. White, the State Geologist, made careful observations in some of those counties, including Franklin, Wright, Cerro Gordo, Hancock, Winnebago, Worth and Kossuth. In 1869, Hon. A. R. Fulton also visited the counties named, and from personal observation

was convinced that the deposits of peat were as extensive as represented by the State Geologist. It is estimated that the counties above named contain an average of at least four thousand acres each of good peat lands. The depth of the beds is from four to ten feet, and the quality is but little, if any, inferior to that of Ireland. As yet, but little use has been made of it as fuel, but when it is considered that it lies wholly beyond the coal-field, in a sparsely timbered region of the State, its prospective value is regarded as very great. Dr. White estimates that 160 acres of peat, four feet deep, will supply two hundred and thirteen families with fuel for upwards of twenty-five years. It must not be inferred that the presence of these peat beds in that part of the State is in any degree prejudicial to health, for such is not the case. The dry, rolling prairie land usually comes up to the very border of the peat marsh, and the winds, or breezes, which prevail through the summer season, do not allow water to become stagnant. Nature seems to have designed these peat deposits to supply the deficiency of other material for fuel. The penetration of this portion of the State by railroads and the rapid growth of timber may leave a resort to peat for fuel as a matter of choice, and not of necessity. It therefore remains to be seen of what economic value in the future the peat beds of Iowa may be. Peat has also been found in Muscatine, Linn, Clinton, and other eastern and southern counties of the State, but the fertile region of Northern Iowa, least favored with other kinds of fuel, is peculiarly the peat region of the State. Neither gold nor silver has been found in Iowa, except a very small percentage of the latter in the galena or lead ores.

“Lead.”—Since the year 1833, large quantities of lead have been mined in the vicinity of Dubuque, and the business is still carried on successfully. From four to six million pounds of ore have been smelted annually at the Dubuque mines, yielding from sixty-eight to seventy per cent. of lead. So far as known, the lead deposits of Iowa that may be profitably worked are confined to a belt of four or five miles in width along the Mississippi, above and below the city of Dubuque.

“Other Metals.”—Iron, copper and zinc have been found in

limited quantities in different parts of the State—the last-named metal being chiefly associated with the lead deposits.

"Lime.—Good material for the manufacture of quick-lime is found in abundance in nearly all parts of the State. Even in the northwestern counties, where there are but few exposures of rock 'in place,' limestone is found among the boulders scattered over the prairies and about the lakes. So abundant is limestone, suitable for the manufacture of quick-lime, that it is needless to mention any particular locality as possessing superior advantages in furnishing this useful building material. At the following points parties have been engaged somewhat extensively in the manufacture of lime, to wit: Fort Dodge, Webster county; Springvale, Humboldt county; Orford and Indiantown, Tama county; Iowa Falls, Hardin county; Mitchell, Mitchell county; and at nearly all the towns along the streams northeast of Cedar river.

"Building Stone.—There is no scarcity of good building stone to be found along nearly all the streams east of the Des Moines river, and along that stream from its mouth up to the north line of Humboldt county. Some of the counties west of the Des Moines, as Cass and Madison, as well as most of the southern counties of the State, are supplied with good building stone. Building stone of peculiarly fine quality is quarried at and near the following places: Keosauqua, Van Buren county; Mt. Pleasant, Henry county; Fairfield, Jefferson county; Ottumwa, Wapello county; Winterset, Madison county; Fort Dodge, Webster county; Springvale and Dakota, Humboldt county; Marshalltown, Marshall county; Orford, Tama county; Vinton, Benton county; Charles City, Floyd county; Mason City, Cerro Gordo county; Mitchell and Osage, Mitchell county; Anamosa, Jones county; Iowa Falls, Hardin county; Hampton, Franklin county; and at nearly all points along the Mississippi river. In some places, as in Marshall and Tama counties, several species of marble are found, which are susceptible of the finest finish, and are very beautiful.

"Gypsum.—One of the finest and purest deposits of gypsum known in the world exists at Fort Dodge, in this State. It is

confined to an area of about six by three miles on both sides of the Des Moines river, and is found to be from twenty-five to thirty feet in thickness. The main deposit is of uniform gray color, but large masses of almost pure white (resembling alabaster) have been found embedded in the main deposits. The quantity of this article is practically inexhaustible, and the time will certainly come when it will be a source of wealth to that part of the State. So far, it has only been used to a limited extent for paving and building purposes, if we except the fraud practised upon our Eastern cousins by those who manufactured from it that great humbug and swindle of the century, the 'Cardiff Giant!' Plaster-of-paris manufactured from the Fort Dodge gypsum has been found equal to the best in quality.

"*Clays.*—In nearly all parts of the State the material suitable for the manufacture of brick is found in abundance. Sand is obtained in the bluffs along the streams and in their beds. Potter's clay, and fire-clay suitable for fire-brick, are found in many places. An excellent article of fire-brick is made at Eldora, Hardin county, where there are also several extensive potteries in operation. Fire-clay is usually found underlying the coal-seams. There are extensive potteries in operation in the counties of Lee, Van Buren, Des Moines, Wapello, Boone, Hamilton, Hardin, and perhaps others.

"*Soil.*—It is supposed that there is nowhere upon the globe an equal area of surface with so small a proportion of untillable land as we find in Iowa. The soil is generally a drift deposit, with a deep covering of vegetable mould, and on the highest prairies is almost equal in fertility to the alluvial valleys of the rivers in other States. The soil in the valleys of our streams is largely alluvial, producing a rapid and luxuriant growth of all kinds of vegetation. The valleys usually vary in extent according to the size of the stream. On the Iowa side of the Missouri river, from the southwest corner of the State to Sioux City, a distance of over one hundred and fifty miles, there is a continuous belt of alluvial 'bottom,' or valley land, varying in width from five to twenty miles, and of surpassing fertility. This valley is bordered by a continuous line of bluffs, rising from one to two hundred

feet, and presenting many picturesque outlines when seen at a distance. The bluffs are composed of a peculiar formation, to which has been given the name of loess or 'bluff deposit.' It is of a yellow color, and is composed of a fine silicious matter, with some clay and limey concretions. This deposit in many places extends eastward entirely across the counties bordering the Missouri river, and is of great fertility, promoting a luxuriant growth of grain and vegetables.

"Mineral Paint.—In Montgomery county a fine vein of clay, containing a large proportion of ochre, was several years ago discovered, and has been extensively used in that part of the State for painting barns and out-houses. It is of a dark red color, and is believed to be equal in quality, if properly manufactured, to the mineral paints imported from other States. The use of it was first introduced by Mr. J. B. Packard, of Red Oak, on whose land there is an extensive deposit of this material.

"Spring and Well Water.—As before stated, the surface of Iowa is generally drained by the rolling or undulating character of the country, and the numerous streams, large and small. This fact might lead some to suppose that it might be difficult to procure good spring or well water for domestic uses. Such, however, is not the case, for good pure well water is easily obtained all over the State, even on the highest prairies. It is rarely necessary to dig more than thirty feet deep to find an abundance of that most indispensable element, good water. Along the streams are found many springs breaking out from the banks, affording a constant supply of pure water. As a rule, it is necessary to dig deeper for well water in the timber portions of the State, than on the prairies. Nearly all the spring and well waters of the State contain a small proportion of lime, as they do in the Eastern and Middle States. There are some springs which contain mineral properties, similar to the springs often resorted to by invalids and others in other States. In Davis county there are some 'Salt Springs,' as they are commonly called, the water being found to contain a considerable amount of common salt, sulphuric acid, and other mineral ingredients. Mineral waters are found in different parts of the State.

"Natural Curiosities.—Aside from its walled lakes and some very beautiful waterfalls, the State does not abound in natural wonders. The 'Ice Cave' at Decorah, in the northeastern part of the State, deserves notice. It is under a bluff on the north bank of the upper Iowa river, and has this wonderful peculiarity that while in winter no ice is to be found in it, it forms in spring and summer, and thaws out again upon the advent of cold weather. Nine miles east of Decorah, on Trout river, there is an underground stream navigable for canoes, and which has been explored for a long distance.

"Climate and Meteorology.—The average or mean temperature, from a series of observations taken at different points and in different years, is found to be 48°. The temperature of the winters is usually somewhat lower than that of the Eastern States, but that of the other seasons higher, so that all vegetation is forced forward rapidly to maturity. There is a somewhat less average amount of rain than that which falls in the States bordering on the Atlantic. The quantity which falls yearly in Iowa is found to average about forty and one-half inches, and of snow thirty inches—equivalent to three inches of rain, making a total of forty-three and one-half inches. There is occasionally a season which greatly exceeds the average in the fall of rain, but never one marked with such extreme drought as to occasion a failure of crops.

"The opinion may prevail to some extent that the climate, especially of Northern Iowa, is rigorous, and the winters long and severe. It is true that the mercury usually sinks lower than in the States farther south, but at the same time the atmosphere is dry and invigorating, and the seasons not marked by the frequent and sudden changes which are experienced in latitudes farther south. The winters are equally as pleasant and more healthful than in the Eastern or Middle States. Pulmonary and other diseases, arising from frequent changes of temperature and miasmatic influences, are almost unknown, unless contracted elsewhere. Winter usually commences in December and ends in March. The spring, summer, and fall months are delightful. Iowa is noted for the glory and beauty of its autumns. That



REAPING—A PRAIRIE HOMESTEAD—THRESHING.

gorgeous season denominated 'Indian summer' cannot be described, and in Iowa it is peculiarly charming. Day after day, for weeks, the sun is veiled in a hazy splendor, while the forests are tinged with the most gorgeous hues, imparting to all nature something of the enchantments of fairyland. Almost imperceptibly, these golden days merge into winter, which holds its stern reign without the disagreeable changes experienced in other climes, until spring ushers in another season of life and beauty."

CHAPTER IX.

KANSAS.

KANSAS is, geographically, the central State of the American Union, and one of the largest and most enterprising of the great States of the central belt of "Our Western Empire." It is bounded on the north by Nebraska, on the east by Missouri, on the south by the Indian Territory, and on the west by Colorado. It would be a perfect parallelogram, but that the Missouri river cuts off a slice of its northeast corner and hands it over to Missouri. It is situated between the 37th and the 40th degrees of north latitude, and between the meridians of $94^{\circ} 35'$ and 102° of west longitude from Greenwich, and is 404 miles long from east to west, and $208\frac{1}{2}$ miles wide from north to south. The latest Land Office Report makes its area 82,080 square miles, or 51,770,240 acres. Population (1890), 1,427,096.

Topography and Surface—Rivers and Lakes—Plains, Prairies and Valleys.—The topography of the State shows an alternation of broad, level river valleys and high rolling prairies, the whole forming a series of gentle undulating plateaus, sloping at an average inclination of seven and a-half feet per mile from the mountains toward the Missouri river. Thus at Monotony the altitude is 3,792 feet; at Wallace, Kansas, 3,319 feet; at Ellis, 2,135 feet; at Abilene, 1,173 feet; at Topeka, 904 feet; and at

Wyandotte, 707 feet. The elevations of corresponding points in the Arkansas valley and on the Atchison, Topeka and Santa Fé Railway, are a little lower in the west, but a little higher as we go east, showing a moderate declination from north to southwest, as well as a more marked one from west to east; thus, Sargent, at the west boundary of the State, is 3,129 feet; Lakin, 3,013; Kinsley, 2,200; Newton, 1,433; Burlington, 1,055, and Fort Scott, 912 feet.

The principal rivers of the State are the Missouri, which washes its northeastern corner for a distance of forty or fifty miles; the Arkansas, which leaves the State near the 97 meridian, after traversing the whole southern and southwestern portion of it; the larger tributaries of this noble river, the North and South Forks of the Cimmaron, Salt and Red Forks of the Arkansas, Chikaskia, Verdigris and Neosho rivers on the south bank, and the Pawnee and Walnut creeks on the north bank; but most important of all for the State, the Kansas or Kaw river, one of the largest tributaries of the Missouri, with the Republican and Smoky Hill rivers, by whose union it is formed, and its numerous affluents, the Big Blue, the Solomon, the Saline, the Soldier, the Beaver, the Delaware, the Stranger, the Sappa, the Grasshopper and the Wakarusa. There are also a few smaller streams in the northeast, affluents of the Missouri, like the Nemaha, etc. These streams form one of the grandest systems of water-courses in the whole country.

Though the surface is rolling and attains so considerable an elevation toward the western border of the State, there are no mountains, nor hardly any ranges of hills in the State; occasionally the bluffs along the rivers are of considerable height above the streams, and in rare instances one or two isolated buttes, or masses of rock, like Castle Rock, in Gove county, the Twin Buttes, in Rooks county, or the Bluff, in Clarke county, attract attention. The State is not remarkable for lakes or ponds, but rather for their absence. There are more in the comparatively arid western counties than in the eastern. The river valleys or river bottoms, as they are called, are very fertile, but except in the Ar-

kansas valley, are sometimes flooded by the swelling of the streams from the melting of the snow.

Geology and Mineralogy.—Professor B. F. Mudge, the eminent State Geologist, has described at considerable length, and with maps and sections, the geology, general and economic, of the State. The following summary gives as good an idea of its very simple geological formations as can be obtained without a geological map. As we have already said, the surface has a gradual but double descent to the east and to the south, or south-southeast. The streams follow the same general direction. The surface, for the most part, is a gentle rolling prairie, with few steep hills or bluffs, and the ravines are not often precipitous or deep. The soil which forms the surface of the whole State, in both valley and high prairie, is the same fine, black rich loam, so common in the Western States. The predominating limestones, by disintegration, aid in its fertility, but the extreme fineness of all the ingredients acts most effectively in producing its richness. On the high prairie it is from one to three feet deep; in the bottom it is sometimes twenty feet. There are a few exceptions to this general fertility in the most western and southwestern counties, but they constitute only a small proportion of the whole. The State is so well drained that there are very few valleys with stagnant ponds, and there is not a peat swamp of fifty acres within its boundaries. The lands toward the Colorado border are often spoken of as alkaline lands, but Professor Mudge says that they are not so. In fifteen years of exploration he had never found but two springs containing alkalies, and had never seen ten acres of land in one place which had been injured by it.

CHAPTER X.

LOUISIANA.

ONLY about two-thirds of Louisiana lie within the bounds of our "Picturesque West." Its commercial and political capital

New Orleans, the chief city of the Southwest, is on the east bank of the Mississippi river, as are several other considerable towns. Its boundaries are: On the north, Arkansas and Mississippi; on the east, Mississippi, and for the greater part of the distance the Mississippi river and Sound; south and southeast, the Gulf of Mexico; and on the west, Texas, the Sabine river being the boundary for about three-fourths of the distance. It is situated between the meridians of 89° and 94° W. from Greenwich, and between the parallels of $28^{\circ} 56'$ and 33° N. latitude. Its extreme length from east to west is 298 miles, and its extreme breadth from north to south 280 miles. Its area is 41,346 square miles, or 26,461,440 acres.

Surface and Topography, Rivers, Lakes, Bayous, Sounds and Gulfs.—The highest land in the State, the hills in its northern and northwest portions, does not exceed 240 feet in height. From these uplands there is a gentle slope both towards the Mississippi river and the Gulf. The delta of the Mississippi, especially below New Orleans, is below the level of the Mississippi at the spring floods; and at least 8,450 miles, or one-fifth of the area of the State, is only protected from annual submergence by the levees. With the exception of a tract in Southeast California, once a part of the bed of the ocean, the greater part of the State of Louisiana is the lowest land in "Our Western Empire." The rivers are the Mississippi, which has a course of about 590 miles within the State, and is now, through the labors of Captain Eads, navigable not only for the largest steamers but for all ocean steamships of the first-class, from its mouth to and beyond the northern boundary of the State; the Red river, one of its largest tributaries, which enters the State near its northwest corner and crosses it diagonally to the 31st parallel, where it joins the Mississippi; the Washita, the largest affluent of the Red river, which comes into the State from Arkansas, and with its two large branches, the Tensas and Boeuf, drains the northern parishes of the State; the Dugdemona, the Saline Bayou, and the Bistineau river and lake, all tributaries of the Red river. The Sabine river, as we have already noticed, forms a part of the western boundary of the State, but receives no considerable af-



RUSSIAN VILLAGE, KANSAS—A DUG-OUT—HAYING.

fluents on the east bank. The Calcasieu and Mermentau are considerable rivers, both having several tributary bayous or sluggish streams. East of the Mississippi are the Pearl river, with its tributary, Bogue Chitto, the Tangipahoa, Tickfaw and Amité. There are, besides these, several large estuaries or bayous, which are really secondary mouths or outlets of the Mississippi, which in flood-time convey a large portion of its waters to the Gulf, and at other times drain the greater part of Southern Louisiana. Among these are: Atchafalaya Bayou with its series of lakes and inlets; Vermillion Bayou, Bayou Teche which connects with it, Bayou de Large, Bayou la Fourche, and the lakes, bays and estuaries which discharge their waters into Barataria bay. In the ordinary sense of the term there are no lakes in Louisiana, all that are so called being either estuaries, bayous or expansions of rivers. Thus Lake Pontchartrain is a land-locked estuary whose waters are salt and rise and fall with the tide; Lake Maurepas is closely connected with Lake Pontchartrain, and partakes of its character; Lake Borgne is only a sound or bay; Sabine lake, Calcasieu lake, Lake Mermentau, Grand lake, Marsh lake, Lake Charles, Grand Cheniere, Caillon, Lake Washa, and the rest are all estuaries connected with rivers or bayous. In the northern part of the State there are ten or fifteen so called lakes which are mere expansions of the Red river, or some of its tributaries. There are numerous bays and sounds along the coast, indenting the alluvial delta of the Mississippi in all its borders.

Geology and Mineralogy.—Three-fifths of the State, including the Mississippi basin and delta, the Red river region and basin, and the Bluff or Loess region, which comprises nearly all of Calcasieu, St. Landry and Lafayette parishes, and a long but narrow strip east of the Mississippi river, belong to the alluvial and diluvial formations. The Mississippi delta proper covers over 12,000 square miles, and its deposits are from thirty to forty feet in depth and of wonderful fertility. The remaining two-fifths of the State is, for the most part, tertiary, the formations in the northwest and west-northwest parts of the State being subdivisions of the eocene. There are occasional small outcrops of

cretaceous strata in the northwest, west and central parts of the State, and in these are found limestone, gypsum, and salt-bearing strata. Below the alluvium and tertiary in the southern part of the State, there are deposits of sulphur, and at one point between the Sabine and Calcasieu rivers, the boring of an artesian well demonstrates that, beginning 428 feet below the surface, there is a deposit of sulphur 112 feet thick, which will yield from sixty to ninety-six per cent. of pure sulphur. Of other minerals and metals Louisiana has not a great variety. Brown coal (lignite) is found in the tertiary in considerable quantities and of moderately good quality. Iron (bog ore, probably) and salt are plentiful in this region, and on Petit Anse island salt has been mined to a depth of sixty feet below the level of the Gulf, fifty-eight feet of it through solid rock-salt of the purest quality. This was in great demand during the late civil war. In the cretaceous rocks, ochre, marl, gypsum, lead, sulphate of soda, sulphate of iron, and a very pure carbonate of lime are found. Petroleum has also been discovered, but not in sufficient quantity to pay for working. Copper and quartz crystals, agates, jasper, cornelian, sardonyx, onyx, feldspar, of fine quality, meteoric stones and numerous fossils have been found in the tertiary.

Soil and Vegetation.—The alluvial and diluvial soils are of extraordinary and unsurpassed fertility. The delta lands are admirably adapted for the culture of sugar-cane, cotton, rice, wheat, barley, sweet potatoes, figs and oranges. The orange is quite as successful, and of flavor fully equal, to those grown in Florida. The Sea island or long staple cotton is grown on the islands of the delta, but on the main land the upland or short-stapled cotton is most generally cultivated. The tertiary region has not so rich a soil, but with proper culture yields good crops. Indian corn yields better there than on the alluvial soils, and cotton is successfully cultivated. A portion of the tertiary region is covered with pine forests, which are heavy but not dense, and these lands, though healthful, are not productive. About one-fifth of the area of the State is too swampy and marshy for cultivation, and much of it is covered with lofty cypress trees, from which the Spanish moss hangs in graceful festoons. The other

forest trees of the alluvial region are the sweet-gum, ash, black walnut, hickory, magnolia, live-oak, Spanish, water, black, chestnut, white and post oaks, tulip-tree (*liriodendron*), linden, Florida anise, lance-leaved buck-thorn, four or five species of acacia, wild cherry, pomegranate, holly, arbor-vitæ, tillandsia, lime, pecan, sycamore, white and red cedar, and yellow pine; in the tertiary lands, sassafras, mulberry, poplar, hackberry, red elm, maple, honey-locust, black locust, dogwood, tupelo, box elder, prickly ash, persimmon, etc. Along the river banks, the inevitable cottonwood, willow-basket elm, palmetto, wild cane, pawpaw, wild orange, etc., are found. Of fruit-trees, the peach, quince, plum, fig, orange, pawpaw, olive and pomegranate are cultivated with great success; the apple and pear do not thrive so well. Local topographers classify the lands of the State as "good uplands;" "pine hill lands," usually not very fertile; "alluvial tracts;" "Bluff or Loess regions;" "marsh lands;" "the prairie regions;" and "the pine flats." The grazing in the uplands generally is excellent; in the Attakapas country, along the Atchafalaya and Bayou Teche, the pasturage is unsurpassed in quality.

Louisiana is a land of fragrant flowers, and the sweet perfume of its orange blossoms, magnolias, jessamines, oleanders, virgin's bower, its innumerable varieties of roses and its thousands of other sweet-scented semitropical and tropical flowers, which grow wild upon its rich alluvial lands, feast the senses with perpetual delight.

Zoology.—The wild animals of Louisiana are for the most part the same as those of Texas, though there is a greater preponderance of reptiles. The jaguar or American tiger, the most formidable of the North American *Felidæ*, is found in the cypress swamps in this State, and in Texas and Arizona. The cougar, puma, panther or American lion, is also an inhabitant of the swamps, and this wild-cat and perhaps some of the other *Felidæ* are also found. The black and brown bear are more common in the uplands; while the raccoon, skunk, opossum, otter and most of the rodents are abundant.

Alligators of great size and ferocity abound in all the bayous, and are destructive of cattle and sometimes of human beings.

It is believed that the crocodile exists in the cypress swamps here as well as in Florida. There are several species of marine turtles and land-tortoises and terrapins. The lizard tribe is largely represented; the gecko, chameleon, lizards of all kinds and sizes, as well as a great variety of batrachians, the horned and common frog, many species of toads; and of ophidians, rattlesnakes, vipers, moccasins, horned snakes, and a great variety of harmless serpents are common. There are many birds of prey: among them are the bald and gray eagle, the king-vulture, the turkey-buzzard and other vultures, kites, owls, hawks, gulls, and, very numerous in the bayous and in the gulfs, bays and sounds west of the Mississippi, the pelican, which has been recognized as the patron bird of the State, which very generally bears the name of "the Pelican State." Cranes, herons, ibises, flamingoes and other waders are found only in this State and Texas of "Our Western Empire;" and wild geese, many species of wild ducks, brant, teal, and some swans are inhabitants of its lakes, bayous and bays in their season. The game birds, wild turkeys, pigeons, partridges and several species of grouse are plentiful in the uplands. Birds of gay plumage, including the macaw and paroquet, and many others, and a great variety of song-birds, among which are the mocking-bird, the cedar bird, several of the finches and tanagers, a great variety of humming-birds, and orioles are abundant in the forests.

Climate.—The climate of New Orleans and of the lower portion of the delta is somewhat malarious, and bilious and congestive fevers, remittent and intermittent, are prevalent. The yellow fever is seldom entirely absent from this region in summer, but becomes epidemic only about once in four or five years. Strict sanitary supervision is maintained, but the drainage is difficult. By careful attention to cleanliness the city is healthier than formerly. The yellow fever made fearful ravages in 1878, and reappeared in a milder form, in 1879: later has been generally healthy. The cholera has at times made fearful ravages here. The water is so near the surface in New Orleans and most of the adjacent region, that all burials are made in cells of vaults, built above the surface. The climate of the upland region is

healthy though warm, and that of the delta is so in winter. The table on next page, giving the meteorology of New Orleans, which represents fairly the region of the delta and of Shreveport, in the northwest of the State, which shows that of the upland country, will exhibit more satisfactorily the climate of the two sections than any general description. Not only from its climate, but from the habits and customs of its people, its productions, markets, etc., Louisiana will be a more agreeable region for immigrants from Southern and Southwestern Europe and from the Southern Atlantic and Gulf States, than for those from more northern climates. The French, Spanish, and Italians, and the Swiss and South Germans will do better here than the North Germans, Scandinavians or inhabitants of Great Britain.

CHAPTER XI.

MINNESOTA.

IF, as is often said, Kansas is the central State of the United States, and Colorado the central region of "Our Western Empire," Minnesota may fairly claim the higher honor of being the central State of the North American Continent. Its boundary at the north is British America, Manitoba abutting upon it at the northwest; at the northeast, for about 120 miles, Lake Su-

perior forms its boundary; on the east it joins Wisconsin, being separated only by the St. Croix and Mississippi rivers; on the south it is bounded by Iowa, and on the west by Dakota Territory, with which it shares the rich and fertile valley of the Red river of the North. It is just about equidistant from the capes of the peninsulas which send off their annual icebergs into the Arctic Ocean, and the narrowing neck of land which, by its volcanoes, lights alike the Pacific Ocean and the Caribbean Sea, from Newfoundland on the east and Vancouver Island on the west. It lies between the parallels of $43^{\circ} 30'$ and 49° N. latitude, and between the meridians of $89^{\circ} 29'$ and $97^{\circ} 5'$ W. longitude from Greenwich. The extreme length of the State from north to south is 380 miles, while its breadth varies from 337 miles, about the 48th parallel, to 262 miles on the south line, and 183 at about $45^{\circ} 30'$. Its area is estimated at the United States Land Office at 83,531 square miles, or 53,459,840 acres. From this area must be deducted 2,900,000 acres of water surface, lakes, etc. (not including that part of Lake Superior which lies within its limits), leaving 50,759,840 acres of land, including the Indian reservations. This is nearly equal to the combined areas of Ohio and Pennsylvania, and a little more than that of Kentucky and Tennessee.

Surface of the Country.—From its location it was inevitable that Minnesota should be the water-shed or divide for all the great streams which traverse the continent east of the Rocky Mountains. It has not, it is true, anywhere within its area, any range of mountains or very high hills, but its general elevation in the northern part of the State, except in the river valleys, is from 1,500 to 1,550 feet above the sea. Across this table-land, in or near the parallel of $47^{\circ} 40'$, is a low, curved line of drift hills, not much, if at all, above 100 feet in height, and extending westward to the bluffs of the Red River valley, when it turns southward, and separates the waters of the affluents of the Mississippi from those of the Red river of the North. In these low hills three great river and lake systems have their sources, viz.: the Mississippi river proper and its northern tributaries; the St. Louis river and its numerous branches, which together form the

head and fountain of those waters which, through the great lakes, find their way to the St. Lawrence, and through its broad expanse to the northern Atlantic Ocean; and the affluents of the Red river as well as those of Rainy Lake and Lake of the Woods, all of which finally discharge their waters into Hudson's Bay and into the Arctic Ocean. There is but one other point in the whole of our Western Empire, or for that matter, in the United States, where rivers flowing to such distant and diverse points have their sources so near together, and that is the point near the Yellowstone Park, where the sources of the Missouri, the Columbia, and the Colorado of the West are found within a mile or two of each other.

There are then three distinct slopes, differing in soil, vegetation, and geological character, in the State. The northern slope, including not only the Red river valley, but the valleys and streams draining into the Rainy Lake chain, and into the Lake of the Woods; the eastern slope, occupying the valley of the St. Louis river, and declining gently toward Lake Superior; and the southern slope, drained by the Mississippi and its affluents, comprising about two-thirds of the State, and extending into, and forming part of, the great Mississippi valley. The descent from the summit of the divide, which has an elevation in lat. $47^{\circ} 45'$ to 48° of about 1,680 feet, to the southern line of the State, lat. $43^{\circ} 30'$, is not far from 930 feet; but except in the successive terraces at and near the Falls of St. Anthony, the declination is very gradual, not exceeding two and a half or three feet to the mile. Three-fourths of the State may be described as generally rolling prairie, interspersed with frequent groves, oak openings, and belts of hard-wood timber, dotted with numberless small lakes, and drained by numerous clear and limpid streams. The remaining fourth includes the hills which form the divide, the extensive mineral tract reaching to Lake Superior, and the heavy timbered region ("The Big Woods") lying around the sources of the Mississippi and the Red river of the North.

Rivers, Lakes, etc.—The greater part of the State, all of it, indeed, except two or three of the northern, and as yet unorganized counties, which are watered by streams falling into the Rainy

Lake chain—is drained by the affluents of the St. Louis, the Mississippi, and the Red river of the North. The St. Louis has fourteen or fifteen tributaries, several of them streams of considerable size; the Mississippi has about fifty—two of them, the St. Croix and the Minnesota, being themselves large rivers; only the affluents of the Red river on the eastern bank belong to Minnesota, but there are fourteen or more of these, of which the Red Grass, Red Lake, Sand Hill, Wild Rice, and Buffalo rivers are considerable streams.

The Rainy Lake river forms a part of the northern boundary, and its affluents, the Big and Little Fork, and the Vermilion river, which flows into the same chain of lakes, are streams of moderate size. There are fifty or more creeks flowing into Lake Superior, which aid in watering and fertilizing this northeastern slope.

Minnesota is emphatically the *Lake* State. In the surveyed area of the State there are upwards of 7,000 lakes; their average extent is about 300 acres, but a number of them exceed 10,000 acres, and others are still larger; Lake Minnetonka covers 16,000 acres; Lake Winnebagoishish, 56,000 acres; Leech Lake, 114,000 acres; Mille Lacs, 130,000; Red Lake, at least 350,000, and Lake of the Woods and the Rainy Lake Chain, which form part of the northern boundary, are still larger. Not content with these, Minnesota claims a considerable slice of Lake Superior as her property. Many of the smaller lakes are very deep, and all are well stocked with fish. Ordinarily their shores are dry and firm down to the water's edge, except at their outlets, and the waters are clear, cool and pure. The bottoms are generally sandy or pebbly. The water of Minnesota, whether obtained from lake, spring or well, is of excellent quality. The beautiful scenery around many of these lakes, and the cascades, rapids and falls at the outlet of others, have made them very pleasant resorts. Among these Minnetonka and White Bear Lakes, and the Falls of Minneopa and Minnehaha have perhaps the widest reputation.

Geology and Mineralogy.—The greater part of the State is covered with a rich and fertile alluvium, or, as in the highlands,

by an older and less fertile drift, which, however, sustains a noble forest growth. Beneath this drift there is, along the northern shore of Lake Superior, and extending southward on both sides of the St. Croix to its junction with the Mississippi, and below that point along the eastern and western banks of that river below the southern line of the State, a broad belt of metamorphic slates and sandstones intermingled with volcanic rocks, traps and porphyries; these are of the Silurian epoch, and many dikes of greenstone and basalt are interjected in the strata. Occasionally deposits of marl-drift and red clay are found above these rocks. This is the principal mineral region of the State. Near the southern boundary of the State, or, rather, in the southeast quarter, between the 92d and 94th meridians, is a small tract of Devonian rocks; west and northwest of the Silurian slates and sandstones, the underlying rocks are eozoic, hornblende and argillaceous slates, and granite, gneiss and metamorphic rocks. In the western and northwestern part of the State, between the 94th and 96th meridians, but not extending below the 46th parallel, and underlying the low hills which form the divide between the affluents of the Mississippi and those of the Red river of the North, is another belt of Silurian rocks, upper Silurian, in the northern portion, and lower Silurian, nearer the Mississippi. These are mostly limestone, and like those of the same epoch farther east are almost entirely devoid of fossils. West of these, and forming the underlying strata of the Red River valley, we find a broad belt of cretaceous rocks, mostly of the Niagara, Galena and Trenton limestones, with smaller outcrops of St. Peter and perhaps Potsdam sandstones. Lastly, in the southwest corner of the State, in and near the valley of the Big Sioux, the eozoic rocks again approach the surface, and some of them are mineral-bearing rocks. The Lake Superior region yields, in large quantity, iron of the same character and purity as that found in the upper peninsula of Michigan, and copper ores identical with those of Ontonagon; but neither have been as yet extensively worked. Gold and silver exist in moderately paying quantities near Vermilion lake, in the northern part of St. Louis county; but the region is yet so wild and inaccessible that the mines are

not now worked. Salt springs occur at various points in the State, and salt of excellent quality is manufactured in the Red River valley, and at Belle Plaine, on the Minnesota river. Among the other minerals of the State are: slates (both building and writing), lime, white sand for glass-making, building stone, peat, marl, tripoli, etc. The red pipe stone, of which the Indians made their pipes, is found in large quantities in the southwest, and is quarried and used for many purposes.

Soil and Vegetation.—The three slopes named under the heading of *Surface of the Country* have each a different soil and vegetable growths. The northern, along the Red River valley, and the basins of the lakes and rivers which form the northern boundary of the State, is a rich alluvial deposit admirably adapted to the growth of cereals and to grazing. The Red River valley, from sixty to seventy miles in width, though but half of it is in Minnesota, is unsurpassed in fertility, and may well become the granary of the world in the production of wheat. While it is cultivated more carelessly than it should be, and averages only about twenty-two or twenty-three bushels of wheat to the acre, it is capable of doing much better than that, and instances are not wanting on land, within twenty months from its first breaking, in which fifty, sixty, eighty, and even one hundred and two bushels of wheat to the acre have been raised, and that not on a single acre only, by any trickery, but on broad fields of sixty or eighty acres. This region has forests of oak, beech, elm and maple, though the greater part is a gently undulating prairie. The eastern slope has much broken land, and is a better mineral than agricultural region; though the soil yields fair crops, especially of roots, much of this slope, as well as the highlands or divides, is covered with a heavy growth of pine, spruce, and other coniferous trees, of great value as lumber, though the soil beneath them, when cleared, is comparatively barren. This region occupies about twenty-one thousand square miles. The southern slope, which comprises all of the State below the highlands, is composed of alternate rolling prairie and woodland, and has a very rich and fertile soil. About one-third of the surface of Minnesota is woodland, and her citizens have wisely taken meas-

ures to renew the forest growth, and not suffer the land to become dry and sterile for the want of forests. They have planted already nearly thirty millions of trees, to replace those which have been cut off. By this wise precaution they have secured to their State its forest supplies, without material diminution. In the southern slope there are detached groves and copses of great beauty sprinkled everywhere among the prairies and around the numerous lakes, while growths of dwarfed oaks skirt the prairies and are known as oak openings. There is also a tract on both sides of the Minnesota river, over one hundred miles in length, and of an average width exceeding forty miles, comprising an area of five thousand square miles, known as the "Big Woods," which is covered with a dense and magnificent growth of hardwood timber. This is said to be the largest forest of deciduous timber between the Mississippi and Missouri rivers. In this, as well as in the smaller groves, are found almost every species of deciduous trees native to the States and Territories north and east of the Rocky Mountains.

The indigenous flora of the State is a combination of the Canadian, or sub-alpine, which is found along our northern frontier, with the Appalachian or Mississippian of the upper portion of the Great Valley. Owing to the great number of small lakes, streams and marshes in the northeast, the aquatic plants of the sub-alpine flora predominate—wild rice, reeds, callas, and water-loving plants generally. In the northeast part of the State it is estimated that there are 256,000 acres of cranberry marsh, which yield abundantly. Wild fruits come to great perfection, and, in cultivated fruits, all except the peach and the later grapes are produced of remarkable excellence and in great quantities. The apples, pears, plums, cherries, early grapes, strawberries, raspberries, currants, blackberries, whortleberries and gooseberries of Minnesota are not surpassed anywhere.

Zoölogy.—The forests abound with wild animals and beasts of prey, but these are not as numerous in the prairie regions. The bear, panther or cougar, wild cat and lynx, and the gray wolf, as well as the marten, fisher, otter, mink, beaver, and muskrat, skunk, raccoon, fox, woodchuck, gopher, hare and squirrel, and other

rodents are sufficiently numerous, and the coyote or prairie wolf hunts in packs in the open lands. Of the larger game there are the elk, two species of deer, and possibly the moose. The buffalo is rarely seen, and the antelope, if ever an inhabitant of this region, north and east of the Missouri, is so no longer. Of game birds, land and aquatic, there is no end. Wild turkeys, pigeons, grouse of several species, and partridges, frequent the woods, and wild geese, several species of ducks, brant, teal, etc., are found in their season in great numbers, around the hundreds of larger lakes. Birds of gay plumage, and those of melodious song, make the woods, lakes and rivers vocal with their sweet notes or brilliant with their varied and beautiful hues. The reptile tribes are not so numerous as elsewhere. There are three or four poisonous, and a considerable number of innocuous serpents, large and small. The batrachians pour forth their music in the northern marshes, but the lizard family are missing. Fish abound in all the waters of the State, and the State Fish Commission, in co-operation with the United States Fish Commission, have been stocking the larger lakes and streams with choice species of edible fish. This work is still progressing.

Climate.—A great deal has been written about the climate of Minnesota, both in its praise and dispraise. From its central situation and the curving northward of the isothermal lines, as well as from its very moderate elevation, the climate is undoubtedly milder than that of States or countries farther east in the same latitude. The mean average temperature of the State has been given as 44.6° Fahrenheit. This is not yet true, though it may become so in a few years. Its present average annual mean, from observations made at many different points for from eight to twelve years past, does not exceed 42.9° Fahrenheit, and this is a very decided advance from the mean of eight or ten years since. As the country is settled, the annual temperature rises, and though there may be occasional severe winters like those of 1877–78, and of 1879–80, when the temperature sinks to —53°, or —60°, yet it is gradually advancing to a milder temperature. The air is very dry and bracing; the rainfall is not as great as it is farther east, and probably averages,

one year with another for the whole State, about 27.5 inches; but it is one of the peculiarities of Minnesota and Dakota, that three-fourths of it falls between April and October, and more than one-half between the 1st of May and the 15th of August—the season when the growing crops most require it. The summer is hot, and everything (including weeds) grows with the greatest rapidity. When the harvest is gathered, winter comes, sometimes with abundant snows, but oftener without them; and the frost-king reigns from November to April, but the dryness of the air renders the intense cold more endurable, and the winter is a season of activity. The climate is healthful, the death-rate low, and malarious diseases unknown. The climate is regarded as a desirable one for consumptives from its dry and bracing air. It is certain that many of those who come to the State with weak lungs, when the disease is not too far advanced, do recover and enjoy good health. The table on page 909 prepared with great care and labor, gives all the necessary particulars for determining the climate of all parts of the State. The temperature, rainfall, humidity, etc., are averages from observations continued for from five to ten years, and are more satisfactory than any statement of the temperature, rainfall, etc., of a single year, which may be exceptional in its character.

Railroads and Steam Navigation.—There are none of the Western States which have made more rapid progress in railroad construction than Minnesota, and none which possess greater facilities for travel and transportation. Let us begin with the navigable waters. The Mississippi, interrupted only by the Falls of St. Anthony, Sauk rapids, and Little Falls, is navigable to the foot of Pokegama Falls, distant but 236 miles from its source.

History.—Father Hennepin, a Franciscan priest, was the first European who is known to have visited Minnesota. In 1680 he ascended the Mississippi with a party of fur traders to the Falls of St. Anthony, to which he gave the name which they still bear. Some French traders and their descendants settled around the falls, but they soon lapsed into Indian customs and modes of life. In 1763 the country subsequently known as the Northwest Ter-

ritory was ceded to Great Britain. In 1766 Jonathan Carver, a native of Connecticut, explored that part of Minnesota extending from the present southern border to the sources of the Mississippi. In 1783 it was transferred to the United States as a part of the Northwest Territory. In 1805 a tract of land was purchased from the Indians at the mouth of the St. Croix river, including the present site of Hastings, and another at the mouth of the Minnesota river, which includes the Falls of St. Anthony. In 1820 Fort Snelling was built, and in 1822 a small grist mill was erected on the present site of Minneapolis for the use of the garrison at Fort Snelling. In 1823 the first steamboat visited Minnesota. Between 1823 and 1830 a small colony of Swiss settled near St. Paul. The Indian title to lands east of the Mississippi was extinguished in 1838. In 1843 a settlement was commenced at Stillwater, on the St. Croix. The Act of Congress establishing the Territory of Minnesota was passed March 3, 1849, and the Territory was organized in the following June. It extended to the Missouri river, and thus included nearly all of Eastern Dakota. Its population was then between 4,000 and 5,000. In 1851 the Indian title to the lands lying between the Mississippi river and the Red river of the North, except the reservations, was extinguished. Immigration at once commenced, though considerably hindered by the very general impression that the region was too cold to produce any crops. Governor Ramsey, the first Territorial Governor, now United States Secretary of War, says that when he came to Washington, and brought with him some ears of corn and wheat raised in the vicinity of St. Paul, he was accused of trying to deceive, for it was said that it was impossible that anything should grow in such an Arctic climate. But the Territory grew, and in 1857 had about 150,000 inhabitants; and on the 26th of February in that year, Congress passed an enabling act, providing for its admission as a State. It was admitted into the Union May 11, 1858. In 1860 it had a population of 172,023. General H. H. Sibley, one of its pioneer settlers, was its first State Governor, and was succeeded in 1860 by Governor Ramsey. In 1862 occurred the Sioux massacre, to which we have

already alluded. Nearly a thousand of the inhabitants of the State were subjected to the most cruel outrages and butchered in cold blood. It seemed at first that this would paralyze the young State, and prevent its growth for a long time. But it had just the contrary effect. The summary and terrible punishment inflicted on the Sioux for their atrocious crimes and their prompt ejection from the State, encouraged immigration, and in the eighteen years which have since elapsed, the State has grown with wonderful rapidity. The railroad controversy, involving the power of the State to limit and reduce the charges for freight, to which all the States of the Northwest were in a greater or less degree participants, was less severe or protracted in Minnesota than in some of the other States, and was amicably settled. In the extent and fertility of her soil; in the cheapness of choice lands, whether purchased from the United States, the State or the railways; in the accessibility of every settled county of the State to the best markets, thereby securing high prices for her products; in her abundant water and all the facilities for successful manufacturing; in the excellence of her educational system and its expansion over the whole State, and in the moral and religious character of its inhabitants, the immigrant will find Minnesota, as a home for himself and his children, unsurpassed by any State or Territory in "Our Western Empire."

CHAPTER XII.

MISSOURI.

MISSOURI is one of the central belt of the States of "Our Western Empire," having the Mississippi for its eastern boundary, and the Missouri in part for its western. It extends (including a small tract lying between the Mississippi and the St. Francis rivers) from the parallel of 36° to that of $40^{\circ} 30'$ north latitude, and from the meridian of $89^{\circ} 2'$ to that of $95^{\circ} 44'$ west longitude from Greenwich. Its greatest length from north to south is about 309 miles; its greatest breadth from east to west 318 miles, and its average breadth about 244 miles. It is bounded on the north by Iowa, the parallel of $40^{\circ} 30'$ forming the dividing line from the Missouri river to the Des Moines, and thence down the channel of that river to the Mississippi; on the east it is bounded by the Mississippi river, which separates it from Illinois, Kentucky and Tennessee; south by Arkansas, on the line of 36° from the Mississippi to the St. Francis river and from the St. Francis to the meridian of $94^{\circ} 38'$, the parallel of $36^{\circ} 30'$; on the west by the Indian Territory, Kansas and Nebraska, following the meridian of $94^{\circ} 38'$, from the Arkansas line to the mouth of the Kansas river, and from that point to the parallel of $40^{\circ} 30'$, the channel of the Missouri river. Its area is 65,370 square miles, or 41,836,931 acres, the whole of which has been surveyed.

Face of the Country.—The State is divided into two unequal portions by the Missouri river, which crosses it from west to east, and also forms its northwestern boundary. The portion south of the Missouri, which forms about two-thirds of the territory of the State, has a very varied surface. In the southeast, the region lying between the Mississippi and the St. Francis rivers, as far north as near the parallel of Cape Girardeau, is very low and swampy and subject to frequent overflow by the Mississippi and its tributaries. This comprises all the land lying opposite to Tennessee, Kentucky, and most of Alexander county,

Illinois. Above this, a little below Cape Girardeau, the highland bluffs commence, and extend up to the mouth of the Missouri. Between St. Genevieve and the mouth of the Meramec these bluffs, which are solid masses of limestone, rise from 250 to 360 feet above the river, and extend westward across the State, but are less precipitous and rugged as they approach the Osage river. In the south and southwestern portion of the State, the Ozark mountains, or, rather, hills, occupy a considerable portion of the country; they form no continuous or systematic ranges, but render the whole region exceedingly broken and hilly, the isolated peaks and rounded summits (*buttes* they would be called farther west) sometimes rising from 500 to 1,000 feet above their bases, and then sinking into very beautiful and often very fertile valleys. Though not distinctly defined, the general course of this hilly region is slightly north of east from the southeastern border of Kansas, where it enters the State to the Mississippi river. Beginning as a broad arable plateau, it slopes gently to the water courses on either side, and with fine farming lands even on its highest levels. For one-third of the distance across the State it possesses no characteristic of a mountain range, and from thence as it extends eastwardly its ridges become gradually more irregular and precipitous, until near the centre of the range they begin to break up into a series of knobs and hills, which finally attain their highest elevation at Iron Mountain and Pilot Knob, in the eastern portion of the State. The numerous river bottoms formed by the tributaries of the Osage and Missouri rivers are generally fertile, but most of them are subject to overflow. Farther north, in the basin of the Osage and above it, the land is mostly rolling prairie with occasional forests; the immediate valley of the Missouri is a rich alluvial valley of great fertility, and abounding in forest trees of magnificent size and circumference.

North of the Missouri the country is generally either rolling or level prairie, though with considerable tracts of timber; it forms a part of that great bed of the prehistoric lake more than 500 miles from shore to shore, through which the Missouri formerly flowed, and which included the greater part of Iowa and Eastern

Nebraska, and its surface soils, for many feet in depth, are composed of loess or silty deposits; the tributaries of both the Mississippi and Missouri have worn deep channels through the rocks, and the valleys of erosion thus made, as well as the surface and soil of this entire region north of the Missouri, are very similar to those of Iowa. The river bottoms are exceedingly rich and productive.

Rivers and Lakes.—The Mississippi river forms the entire eastern boundary of the State, for a distance of 540 miles. The Missouri river flows along its western boundary, separating it from the States of Nebraska and Kansas, for a distance of 250 miles, and then flows eastwardly entirely across the State, until it joins the Mississippi upon the eastern boundary, twenty miles above St. Louis, a distance of 450 miles; thus giving the State a shore line upon these two great inland arteries of commerce of upwards of 1,550 miles. The tributaries of the Mississippi on its west bank in this State are, with the exception of the Missouri, mostly small and of no great importance. The St. Francis and its largest tributary, the Little river, as well as the White with its numerous branches, forks, and its tributaries, the Black, Current, Paint and Spring rivers, all belong to Arkansas, and enter the Mississippi in that State. The Meramec and its principal tributary, the Big river, is the only considerable affluent of the Mississippi in the State south of the Missouri. North of that river, Salt river is the largest affluent, but the Cuivre or Copper river, North river, South, Middle and North Fabius, Wyaconda and Fox rivers, are streams of considerable size. The Missouri receives numerous large affluents in the State. On the south side are the Lamine river, the Osage (a large and beautiful stream), with its tributaries, the Little Osage, Marmiton, Sac river, Grand river, Pomme de Terre, Big and Little Niangua, Auglaize, and Marie's creek; and Gasconade river, with its Osage, Lick and Piney Forks. On the north side there are the Nishnabotona, the Big and Little Tarkio, Nodaway, Platte, Grand (with fourteen considerable tributaries), Chariton (with seven or eight), Rocher Perché, Cedar, Muddy and L'Outre creeks. In the southwest the Neosho, an affluent of the Arkansas, with its tributaries, drains six or eight

counties. Wherever the Great American Desert may be, it is certain that no part of it is in a State whose every county is so abundantly watered by large and small streams as Missouri. There are comparatively few lakes in the State. In the southeast there are extensive swamps, overflowed at seasons of high water like those on the Atlantic coast. In St. Charles county, between the Missouri and the Mississippi, there are a number of small lakes. In the northwestern part of the State, in Platte, Buchanan and Holt counties, there are several lakes of considerable size. The Missouri, as well as the Mississippi, at times widens into a wide expanse of water dotted with islands.

Geology and Mineralogy—The geology of Missouri may be briefly summed up as follows: 1. Quaternary (alluvium, bluff, and drift or loess) deposits, found in greater or less degree all over the State, but especially deep and thick in the southeastern counties, Ripley, Butler, Dunklin, Pemiscot, New Madrid, Mississippi, Scott, Stoddard, and portions of Carter, Wayne and Bollinger, as well as through the immediate valley or bottom lands of the Missouri, to the point in the northwest at which it enters the State. There are no tertiary, cretaceous, triassic or jurassic groups in the State, but we come below the quaternary immediately upon—2. The upper carboniferous, which with—3. The lower carboniferous, covers 23,000 square miles of the State. There are in these two formations, the upper, middle and lower coal, and the Clear creek sandstone of the upper carboniferous, and six successive deposits of the lower carboniferous, comprising an unclassified sandstone, and the St. Louis, Keokuk and Chouteau groups of limestones and sandstones, most of them rich in fossils. This great coal field occupies in general the western, northwestern and northern portions of the State.

Next in order, and for the most part immediately adjacent to the coal measures, are—4. Three considerable tracts of Devonian rocks, one in the southwest, another in the northeastern part of the State, and the third a narrow belt which follows the eastern edge of the carboniferous deposits in all their devious lines, and extends southeast to the immediate vicinity of St. Louis. The only strictly Devonian rocks in the State are the Hamilton and Onondaga groups, both mainly limestones.

5. The upper and lower Silurian formations come next in order; they occupy a tract almost 200 miles in width, and extending from the Missouri river to the southern line of the State, and also crop out in the immediate bottom lands of the Mississippi above the mouth of the Missouri. The groups of the upper Silurian found here are Oriskany sandstone, lower Helderberg or Delthyris shale, Niagara group, and Cape Girardeau limestone. Of the lower Silurian formation there are three groups belonging to the Trenton period, viz.: The Cincinnati, Galena and Trenton groups, composed mainly of shales and limestones; and three groups of the magnesian limestone series, consisting of magnesian limestones, saccharoidal and other sandstones, and Potsdam limestones, sandstones and conglomerates.

6. Below these, around the head waters of the affluents of the St. Francis and White rivers, there are frequent outcrops of eozoic or archaic rocks—greenstone, porphyry and granite. Much of the limestone of the coal measures, as well as some of the other formations, is cavernous, and there are numerous caves of great extent and beauty in the central and western portions of the State.

Missouri has a great variety of minerals, and in those of greatest economic value is hardly surpassed by any State or Territory of "Our Western Empire." Gold has thus far been discovered only in the drift in Northern Missouri in placers overlying the coal measures, and therefore without hope of veins or lodes; these placers are, as they are situated, too lean for profitable working, yielding only from thirteen cents to \$2.51 per ton. Silver has been diligently sought in the lead ores which abound in the State, but they are not, to any profitable extent, silver-bearing. In August, 1879, argentiferous galena was discovered in the eozoic rocks in Madison county, one of the eastern counties of the State, about twelve miles east of Iron-ton, and perhaps fifteen miles southeast of Pilot Knob. What is the value of these lodes is not stated, but they are sufficiently rich to have drawn about twenty companies there, who are now at work, and are very sanguine that these lodes also contain gold and platinum. The first attempts to reduce the ores were made by the wet amalgamation process, and not by smelting.

But if the precious metals (so called) have not hitherto yielded much wealth to Missouri, her mines of lead, copper, zinc, and, above all, of coal and iron, have made ample amends for any lack of the others. Iron is found in some form in every county in the State—bog ores in Southeastern Missouri; limonite, or brown hæmatite, in most of the southern counties; gœthite, a variety of the brown hæmatite in Adair county; red hæmatite throughout the coal measures; red and yellow ochres in many counties; spathic ores in the coal measures and in Phelps county; the specular oxide, in vast masses, such as the Iron mountain, Shepherd mountain, Pilot Knob, Simmon mountain, Iron ridge, the Meramec mines, in Phelps county, and numerous other deposits in eight or ten other counties; sulphurets (iron pyrites) throughout the coal measures, and sulphate of iron (copperas) in the coal measures and abandoned coal mines. Some States and Territories have perhaps an equal abundance of iron ores, but lack smelting coals to reduce them; but Missouri has an abundance of excellent smelting coals and fluxes in close proximity to her beds of iron ores.

After iron, lead is the metal most largely produced in Missouri, her product of that metal being greater than that of all the rest of the United States. Our latest complete statistics of the lead produced in the State are for 1879, when the St. Louis Merchants' Exchange reported a production of 56,868,960 pounds. This was a very decided falling off from the product of 1878, which was 60,348,560 pounds, and still more from that of 1877, which was 63,202,240 pounds. About one-third of the whole was exported. The consumption as well as the production of lead has largely increased within the past five years, and while Colorado, Montana, Utah, Nevada and California are sending into market large amounts of lead parted from silver, and New Mexico and Arizona are preparing to do the same, the production in Missouri, Iowa and Kansas has also increased and kept pace with them. There are two great lead fields—one in Southeastern and the other in Southwestern Missouri. It is also found in smaller quantities in many counties outside of these lead fields; galena, or sulphuret of lead, and cerussite, or the carbon-

ate, are the principal ores, though some deposits of the phosphate (pyromorphite) are found. Zinc in the form of blende is abundant in the same regions as the lead—in Southeastern and Southwestern Missouri, and the silicates and carbonates, also, while zinc bloom sometimes occurs. The production of zinc in Missouri is about one-third of that in the entire United States, and is exceeded only by that of Illinois. Copper in the form of blue and green carbonates (malachite) and sulphurets, is found in large quantities in Shannon, Crawford, Jefferson, Franklin and Madison counties, and in smaller quantities in a dozen other counties. For many years copper mining was successfully carried on in the State, and even now small quantities are produced; but the yield of copper in the ores ranges only from twenty-two to twenty-six per cent., and the Lake Superior ores are so much richer, and their mines contain so much native copper as to render the business generally unprofitable. The sulphate of cadmium (greenockite) is associated with the zinc blende in many of the mines. Nickel and cobalt are found in paying quantities at Mine La Motte, in Madison county, and in the St. Joseph mines, and the beautiful hair-like crystals of sulphuret of nickel (Millerite) in the vicinity of St. Louis. Wolfram occurs in Madison county, and manganese and manganiferous iron in Iron and other counties.

Of minerals, not ores, there is a great variety; carbonate of lime (calcite), arragonite, pearl spar, fluor spar, quartz in all forms; heavy spar (sulphate of baryta), mainly used in the adulteration of white lead; gypsum, mainly in the form of selenite; pickeringite, feldspar, mica, hornblende, asbestos, bitumen or mineral tar (throughout the coal measures), fire-clay, potter's clay and kaolin; an excellent glass sand from the saccharoidal limestone; lime of several qualities; hydraulic lime and cement; polishing stone, saltpetre, building stones of granite, sandstones, limestones and marbles, grindstones, millstones, slates, and numerous fine varieties of colored marbles are the principal of these. But of all the minerals not metallic, coal is the most important in Missouri. The coal fields underlie an area of about 26,000 square miles in the State. The coal includes deposits belonging to the upper, middle and lower coal measures, and is of various quali-

ties, some being common bituminous, some very rich in carbon, and developing excellent results under the coking process, while some will not coke; some is equal in quality to the Liverpool cannel coal. The percentage of fixed carbon varies from thirty to sixty per cent., the average being not far from fifty per cent. Among the coal beds already worked are many which produce excellent smelting coals, though perhaps a larger number yield a coal better adapted to the use of locomotives and stationary engines. The coal mines are usually easily worked, and do not require deep shafts or expensive machinery, and coal is very cheap. There are many mineral springs in the State, sulphurous, saline and chalybeate, but none of national reputation. There are also brine springs in Howard county, which yield from two to three ounces of very pure salt to the gallon.

Zoölogy.—Having extensive forests, Missouri has an abundance of wild animals. They are mostly those of the Mississippi valley and of the plains. Bears (the black and cinnamon), cougars or panthers, wild cats, lynxes, wolves, both the gray wolf and the coyote, foxes, raccoons, opossums, skunks, beavers, martens, minks, muskrats, gophers, woodchucks, and nearly all the rodents and burrowing animals. The buffalo and the elk have disappeared from Missouri, though they were formerly abundant there; but there are two species of deer, antelopes (rare), rabbits and hares. Wild turkeys, quails, pigeons, partridges, prairie hens (though these are not as numerous as formerly), and other grouse exist in great abundance. The birds of prey, eagles, vultures, hawks, owls, etc., destroy great numbers of game birds and rodents; wild geese, ducks, brant, teal and snipe are found in their season on the rivers and in the marshes, and with them herons, swans, divers, and more rarely ibises. Snakes, lizards, frogs, toads, turtles, etc., are numerous.

Climate.—The climate of Missouri is generally healthy, except in the river bottoms and the marshy districts of the southeast; but it is a climate of frequent changes and of great extremes. The months of July and August are marked by extreme heat, and there are periods of equally intense cold in January and February. The autumn and spring are very mild and pleasant, though with occasional days of intense cold or heat.

We give below the following additional items in regard to the meteorology of St. Louis, taken from the Signal Service Reports.

MONTHS 1878.	Monthly and annual mean actual pressure of barometer, corrected for temperature, etc.	Monthly and annual mean relative humidity.	Monthly and annual Rainfall.	Prevalent winds and their direction each month.
	Inches.	Per cent.	Inches.	
January.....	29.462	66.4	2.36	N. W., S., W., N., E.
February.....	29.361	65.2	1.69	N., S., N. W., N. E., S. E.
March.....	29.353	56.6	2.79	S., N. W., S. E., W., N.
April.....	29.201	55.5	6.74	S. E., N., N. W., S., S. W.
May.....	29.362	63.1	4.63	S., N. W., N., S. E., N. E.
June.....	29.366	60.8	2.40	S., N., S. E., N. W., W., N. E.
July.....	29.398	62.9	3.92	S., N., N. E., E., S. W.
August.....	29.372	64.2	4.75	S., N., S. W., N. W., N. E.
September...	29.503	59.9	3.42	S., N., S. E., E., N. W.
October.....	29.475	60.6	3.27	S., N., N. W., W.
November...	29.467	61.7	1.38	S., N. W., W., N., S. E., N. E.
December....	29.562	74.0	3.48	W., N. W., S. E., N., S., E.
Year.....	29.476	62.6	40.83	S., N. W., N., S. E., W., N. E., E.

According to a well-known authority, Dr. Engleman, of St. Louis, the mean annual temperature on a line passing across the State from east to west, not far from its northern border, is 50° Fahrenheit; a little south of the middle, including St. Louis, 53° Fahrenheit; at about middle, including St. Louis, summer mean 75° Fahrenheit; somewhat north of southern border, also including St. Louis, winter mean 32° Fahrenheit. The Doctor states that the climate on the whole is dry and rarely overloaded with moisture, and that it yields an unusual amount of fair weather.

Such meteorological conditions are highly conducive to health, since they admit of and encourage active out-door life at all seasons. Missouri presents such a diversity of surface that all can find localities within its boundaries suitable to their peculiarities of constitution. The Signal Service Reports do not vary greatly from Dr. Engleman's meteorological estimates, but they exhibit one feature which he does not particularly notice, viz.: the great range of the thermometer in the winter, spring and autumn months. The annual range is about 93°; the range of

the spring months averages 80° ; of the summer, about 45° ; of the autumn, about 65° ; and of the winter, a little more than 70° .

The average rainfall all over the State is 40.5 inches, and contrary to the popular belief is greater in the western than in the eastern part of the State, being 46.16 at St. Joseph, and only 37.83 in the same years at Jefferson Barracks, on the Mississippi.

Soil and Vegetation.—The Hon. Andrew McKinley, President of the Missouri State Board of Immigration, a man thoroughly familiar with the soils and productive capacity of the Missouri lands, thus classifies and describes them:

“When the territory now embraced within the boundaries of Missouri emerged from the waters that covered it, the marls of the bluff formation were the upper stratum beneath the soil, of all that section of the State lying north of the Osage and Missouri rivers, and also of the county of St. Louis and other counties lying on the Mississippi river, to the southern boundary of the State. This formation furnishes a deep, porous, flexible and imperishable sub-soil, that absorbs moisture like a sponge and enables the soil to endure greater excesses of rain or drouth than any other. It rests upon the ridges and river bluffs and descends along their slopes to the lowest valleys. Reposing on this surface is a great variety of soils, each in its kind of unsurpassed fertility and productiveness. From time to time animal remains and decayed vegetable matter, in vast profusion, but in just proportions, were added, until the soil formation became complete, and now exhibits all of the essentials for the fullest nourishment of the vegetable kingdom. In the process of the formation of the upper soil, a rank vegetation of grasses, plants and trees sprang up, which was suppressed in the dryer portions by fires that overrun the country. Along the streams, and where there was a scarcity of vegetation, the fires failed to destroy the young trees, which grew apace until strong enough to resist, and then they began to encroach upon the prairies; this they continued to do until more than one-half of the State was appropriated by our magnificent forests.

“The margins of the rivers first received the most extensive deposits of soil matter from floods, which carried down the wealth

of the vast regions they drained, and, upon the subsidence of the waters, deposited it on the lower levels. Each flood furnished its new supply, adding to the height of the bottom lands until, after the lapse of time, they became, for the most part, sufficiently elevated to be above danger of overflow. No rivers of the world can boast of more extensive bottom lands than can the Missouri and Mississippi, and none have soils with ingredients richer, better combined, or more productive.

“For practical purposes, the best classification of the soils of Missouri is that adopted by Professor Swallow, which, after defining them in general as forest, prairie and alluvial lands, indicates their great variety by the kind of timber which is most abundant on them, or, where timber is wanting, by the grasses and plants of the prairie. Following this classification those known as *Hackberry Lands* are first in fertility and productiveness. Upon these lands also grow elm, wild cherry, honey locust, hickory, white, black, burr and chestnut oaks, black and white walnut, mulberry, linden, ash, poplar, catalpa, sassafras and maple. The prairie soils of about the same quality, if not identical, are known as *Crow Foot Lands*, so called from a species of weed found upon them, and these two soils generally join each other where the timber and prairie land meet. Both rest upon a bed of fine silicious marls, and even under most exhaustive tillage will prove perpetually fertile. They cover more than 7,000,000 acres of land. On this soil white oaks have been found twenty-nine feet in circumference and one hundred feet high; linden twenty-three feet in circumference and quite as lofty; the burr oak and sycamore grow still larger. Prairie grasses, on the Crow Foot Lands, grow very rank and tall, and by the old settlers were said to entirely conceal herds of cattle from the view. These lands alone are capable of sustaining a population greater than that now occupying the State of Missouri.

“The *Elm Lands*, whose name is derived from the American elm, which here grows magnificently, are scarcely inferior to the hackberry lands, and possess very nearly the same growth of other timber. The soil has about the same properties, except

that the sand is finer and the clay more abundant. The same quality of soil appears in the prairie known as the *Resin Weed Lands*.

"Next in order are *Hickory Lands*, with a growth of white and shellbark hickory, black, scarlet and laurel oaks, sugar maple, persimmon and the haw, red-bud and crab apple, trees of smaller growth. In some portions of the State the tulip tree, beech and black gum grow on lands of the same quality. Large areas of prairie in the northeast and southwest have soils of nearly the same quality called *Mulatto Soils*. There is also a soil lying upon the red clays of Southern Missouri similar to the above. These hickory lands and those described as assimilating to them, are highly esteemed by the farmers for the culture of corn, wheat and other cereals. They are admirably adapted to the cultivation of fruits, and their blue grass pastures are equal to any in the State. Their area may be fairly estimated at 6,000,000 acres.

"The *Magnesian Limestone Soils* extend from Callaway county south to the Arkansas line, and from Jefferson west to Polk county, an area of about 10,000,000 acres. These soils are dark, warm, light and very productive. They produce black and white walnut, black gum, white and wahoo elms, sugar maple, honey locust, mulberry, chestnut, post laurel, black, scarlet and Spanish oaks, persimmon, blue ash and many trees of smaller growth. They cover all the country underlaid by the magnesian limestone series, but are inconvenient for ordinary tillage when they occupy the hillsides or narrow valleys. Among the most fertile soils in the State, they produce fine crops of almost all the staples, and thrifty and productive fruit trees and grape vines evince their extraordinary adaptation and fitness to the culture of the grape and other fruits. Large, bold springs of limpid, pure and cool waters gush from every hillside and flow away in bright streams, giving beauty and attraction to the magnificent forests of the elm, the oak, the mulberry and the buckeye, which often adorn their borders. The mining regions embraced in this division of the soils are thus supplied with vast agricultural wealth and a large mining, pastoral and agricultural population may here be

brought together in relations scarcely to be found in any other country in the world. Blue grass and other succulent and nutritious grasses grow luxuriantly, even on the ridges and hillsides of the upland forests, in almost every portion of Southern Missouri. The alfalfa grass (*medicago sativa*), so highly prized in California, has been introduced into this part of Missouri, and proves a valuable addition to the forage grasses, yielding eight tons of the best of hay at four cuttings, withstanding summer droughts, and furnishing excellent pasture in October and November.

"On the ridges, where the lighter materials of the soil have been washed away, or were originally wanting, *White Oak Lands* are to be found, the oaks accompanied by shellbark and black hickory, and trees and shrubs of smaller growth. While the surface soil is not so rich as the hickory lands, the sub-soil is quite as good, and the land may be greatly improved by turning the sub-soil to the surface. These produce superior wheat, good corn and a very fine quality of tobacco. On these lands fruits are abundant and a sure crop. They embrace about 1,500,000 acres.

"*Post Oak Lands* have about the same growth as the white oak lands, and produce good crops of the staples of the country, and yield the best tobacco in the West. Fruits of all kinds excel on this soil. These lands require deep culture.

"The *Black Jack Lands* occupy the high flint ridges underlaid with hornstone and sandstone, and under these conditions are considered the poorest in the State, except for pastures and vineyards. The presence, however, of black jack on other lands does not indicate thin or poor lands.

"*Pine Lands* are extensive, embracing about 2,000,000 acres. The pine is the long leaf variety, grows to great size, and is marketable. It is accompanied by heavy growths of oak, which takes the country as successor to the pine. This soil is sandy, is adapted to small grains and grasses, and carries fertilizers well.

"The bottom lands of the southeast are now being rapidly reduced to cultivation by the common effort of the lumberman and settler.

Historical Dates.—First settlements in Missouri at or near St. Louis and Cape Girardeau, by the French, probably in 1720; at St. Genevieve about 1755. In 1775 St. Louis was a fur depot and trading station, with 800 inhabitants. In 1803 France ceded all this territory to the United States. In 1805 St. Louis was made the capital of the new Territory of Louisiana. In 1810 there were 1,500 inhabitants within the present limits of Missouri. In 1812 the name of the Territory was changed to Missouri Territory. In 1820 the people prepared and adopted a State Constitution. It was admitted into the Union as a State August 10, 1821, after a bitter and violent controversy in Congress as to its admission as a slave State, by an act known as the Missouri Compromise, which permitted slavery there, but prohibited it in all territory north of 36° 30' north latitude. This act was virtually repealed in 1854. The people took part in the Kansas difficulties of 1854–59, and were very much divided in the civil war. Several severe battles were fought in the State. A new Constitution was adopted in 1865, and still another in 1875.

CHAPTER XIII.

MONTANA.

MONTANA (adm. in 1889) is a Central State of the Northern belt of States of "Our Western Empire." About four-fifths of its area lies east of the Main Divide of the Rocky Mountains. Between this Main Divide and the Bitter Root Mountains, which are a second range of the Rocky Mountains, and form the boundary between Montana and Idaho, is a broad, elevated valley, through which flows Clarke's fork of the Columbia river. East of the Main Divide there are several isolated *mesas* or plateaus, such as the Snake's Head, Beque d'Otard, Bear's Paw, Little Rocky Mountains, the Snow Mountains and Bull Mountains farther south. In the southeast there are several short ranges extending northward from Wyoming, and part of them apparently connected with the Black Hills. These are, begin-

ning with the west, a short spur from the Big Horn range, the Wolf Mountains, Tongue River Mountains, and the Powder River range, which consists of four or five chains of hills of no great elevation, on both sides of the Powder river and its tributaries, and Cabin creek, all affluents of the Yellowstone. The valleys of the Missouri and its three constituent streams, the Madison, Jefferson and Gallatin, of the Yellowstone and its numerous tributaries, of Clarke's fork, the Milk river, Maria's river, Flathead, Musselshell and other rivers, affluents of the Missouri or the Yellowstone, are fertile and level or rolling lands, somewhat elevated, but not cold or bleak. The timber of Montana is peculiar, there being very little hard wood; if deciduous, the trees are almost wholly willow, poplar, linden and cottonwood; the only exception being on Tongue river, near the southern boundary, where there are large bodies of oak; if evergreens, pine, spruce, fir, cedar and balsam. The native grass is mainly the bunch grass, which grows to the height of four or five feet, and is the most nutritious of all the native grasses of this region for cattle, fattening them more thoroughly than corn or barley. Flowers are abundant in their season in all the valleys.

Montana is bounded on the north by British Columbia; on the east by Dakota; on the south by Wyoming and Idaho; on the west by Idaho, from which it is separated by the Bitter Root Mountains. It lies between the parallels of $44^{\circ} 6'$ (its southwestern corner only extending below 45°) and 49° north latitude; and between 104° and 116° west longitude from Greenwich. Its greatest length from east to west along the 48th parallel is over 700 miles; and its greatest breadth near the 113th meridian is about 340 miles. Its area is 143,776 square miles, or 92,016,640 acres.

Mountains, Lakes, Rivers, etc.—Montana is appropriately named, for mountain ranges, spurs, isolated peaks and hills constitute a large portion of its surface. Yet between, around and among these mountains are a great number of as lovely valleys as the sun ever shone upon. The mountains, unlike those of Idaho, are not, with a few exceptions, bare, with steep and inaccessible sides, but rounded summits, covered either with grass

or timber to the very top. They are admirably adapted to grazing, and of all the lands of "Our Western Empire," Montana is likely to be most completely the grazier's paradise. The summits are none of them so lofty as some of those in Idaho or Colorado, none of them reaching 11,000 feet. There are three peaks in the Yellowstone Park which are credited, not all of them correctly, to Montana. Of these Electric Peak is 10,992 feet; Mount Washburn, 10,388 feet, and Mount Doane, 10,118 feet. Aside from these there are but six peaks above 9,000 feet in height. These are: Emigrant Peak, 10,629; Ward's Peak, 10,371; Mount Delano, 10,200; Mount Blackmore, 10,134; Old Baldy, 9,711, and Badger's Peak, 9,000 feet. There are four passes over the Rocky Mountains within the limits of the Territory: Cadott's pass, between the 47th and 48th parallels, 6,044 feet high; Deer Lodge pass, between the same parallels, 6,200 feet; Lewis and Clarke's pass, 6,323 feet, and Flathead pass, in the north of the Territory, 5,459 feet. The general elevation of the Territory is from 2,500 to 3,000 feet.

Montana is not, like Minnesota, a land abounding in lakes. There are not more than ten or twelve in the Territory; of these Flathead lake is the largest, and Grizzly Bear lake, a triangular lake in the western part, nearly north of Helena, the most peculiar in form.

Montana is certainly well supplied with rivers, though portions of it may need irrigation. The Missouri, including its head waters, has a course of more than 1,200 miles in this Territory; the Yellowstone, its largest affluent, about 850; Maria's river, Milk river, Breast or Teton river, Rolling Branch and Park river are the principal tributaries of the Missouri on its north bank; on its south bank it receives Red Water, Elk Prairie and Big Dry creeks, and the large and important Musselshell river, the Judith river and many smaller streams, besides the three forks, Jefferson, Madison and Gallatin, which unite to form the Missouri. The Yellowstone, rising in Yellowstone lake in the National Park, has numerous affluents, especially on its south bank; among these are Clarke's fork, Pryor river, the Big Horn or Wind river, Rosebud creek, Tongue river, the Powder river with its numerous

branches, and Cabin creek. In the valley, between the Rocky and Bitter Root Mountains, the Clarke's fork of the Columbia river has a course of about 300 miles, and the Lewis fork or Snake river, another affluent of the Columbia, has its source in Yellowstone National Park, and perhaps within the bounds of Montana. The Kootenai, probably still another tributary of the Columbia, has its head waters in Northwestern Montana. Clarke's fork has two or three affluents of considerable size, the most important of which are the Missoula and the Flathead river; the latter passes through Flathead lake. Nearly all these rivers furnish abundant water-power.

Geology and Mineralogy.—The volcanic action in the past, and the repeated epochs of upheaval, have made the geology of Montana somewhat involved, but some simple explanations will give the reader a tolerable understanding of it. In the early geologic ages, the eastern half of Montana seems to have been a shallow sea, and its deposits were of chalk and the chalky limestones of the cretaceous period. These cretaceous deposits were succeeded farther west by the rocks of the Wealden and Jurassic periods—limestones, sandstones and shales, and during their deposition, as well as that of the cretaceous rocks farther east, there was a great abundance of the lower forms of animal life of gigantic size, mollusks and radiate animals, and some fish. The ammonites, conchifers, gasteropods, terebratulæ and other radiates and mollusks found in these rocks are among the largest of these fossils ever discovered. Fossil plants are also plentiful, and, in the Wealden, fossil insects, reptiles and fish abound; at the western limit of these beds there are narrow belts of Silurian rocks. Over all the Rocky Mountain region, in the Bitter Root range and the valley between, as well as in occasional patches east of the mountains, especially in the isolated mountains and buttes of Central Montana, we have evidence of repeated and violent convulsions of nature, and the ejection of vast quantities of lava and of molten azoic and metamorphic rocks through the superimposed strata. There were at one time numerous active volcanoes in this region. The repeated upheavals and their time of activity was probably mainly during the

tertiary period, though a later upheaval occurred in the post-tertiary or quaternary period, perhaps almost within historic times. As a result of this action, the whole of the Rocky Mountain summits and those of the Bitter Root Mountains, Bear Paw, Great and Little Belt, Crazy, Judith, Snowy and Highwood Mountains, are composed of eozoic rocks, granite, porphyry, trap, etc., and contain many veins and lodes of gold, silver, copper, lead and zinc, and possibly platinum and quicksilver. The course of these veins, as well as the regular position of the stratified rocks, is greatly disturbed and deranged by the frequent dikes of porphyry, trap and obsidian which have intruded upon the others when in a state of fusion.

Bordering these igneous rocks we find belts of Silurian rocks, and beyond these the Jurassic and Wealden beds, often overlaid by either tertiary or post-tertiary deposits, and these by alluvium. Farther south, in the Yellowstone Park, we find abundant evidence that volcanic action, though feebler now than formerly, has not yet ceased. After the volcanic action of which we have spoken, Montana must have presented the appearance of a series of large fresh water lakes whose shores were the summits of the present mountain ranges. From these mountain slopes came extensive glaciers, as the elevation was greater than now after many ages of denuding action and the intense cold of that time favored the formation of these glaciers, which carried down in the glacial deposits large quantities of gold and silver, and thus formed those immensely rich placers which have yielded such vast quantities of gold. While the glaciers, by their denudatory action, reduced the mountains and cut them into the most fantastic shapes, there must have been also a gradual subsidence of these elevated plains, and this subsidence rendered the climate milder, and thus the ice of the glaciers, melting the moraines or debris, were deposited along their course. The boulders scattered by these glaciers are found all over the western half of Montana, and to a considerable extent in the southeast also. Eastern and Northeastern Montana, having been originally the bed of a lake, have not undergone so many changes, and the superficial geology is later; the tertiary and post-tertiary deposits are

the surface rocks of this region, though there are occasional outcrops of the cretaceous rocks. It is a disputed point whether the lignite or brown coal of the region lying west of the Little Missouri river and extending almost to the Rocky Mountains, and from the Black Hills nearly to the British line, belongs to the tertiary or to the cretaceous epoch, but the opinion of the most eminent geologists is in favor of its being a tertiary deposit. It is a very good coal, and is coming into demand largely not only for the Northern Pacific Railway, which traverses it for hundreds of miles, but for domestic purposes, for which purpose it is far better than the cottonwood and linden firewood, and is less than half the price of wood.

The mineral wealth of Montana is very great. The whole region lying west of the Big Horn, Musselshell and Milk rivers, comprising fully three-fifths of the Territory, is full of gold and silver. The placers and gold lodes of this region lying west of the foot-hills of the Rocky Mountains, comprising not more than one-fourth of the territory, have yielded in gold since 1863 about \$140,000,000 in gold and \$10,000,000 or more in silver. Eastern Montana, except perhaps in the southeast, is better adapted to agriculture and grazing, though this, as we have said, includes extensive beds of coal. Of other minerals, copper, lead and zinc are found extensively, the last two generally in connection with silver. There are immense beds of iron ores. Petroleum has been discovered at several points. The silver ores of Montana belong to the refractory class, and the principal obstacle in the way of a much greater annual yield from the rich silver mines of Montana has been due to this very refractoriness. The ores averaged perhaps sixty-five to seventy-five ounces of silver, and from twenty to forty-five per cent. of lead to the ton, but in the various processes necessary for their reduction—processes which could only be conducted at Omaha, Newark, N. J., or Freiberg, Germany, and the enormous expense of their transportation to a railroad, the nearest being about 300 miles distant, and the freight very heavy, while the reducing processes were also expensive—there was a necessary expenditure of from \$108 to \$114 per ton, and the returns did not come in under from four

to six months from the time of shipment of the ore. Under these circumstances the mining companies lost money on all ores which did not yield at least 140 ounces of silver to the ton, and even on 150 ounces they only made a mere pittance. Several attempts were made to establish reduction works at some point in the Territory, but owing to the immense cost of their transportation and bad management afterwards, they all proved failures. The last effort was made in 1879 at Wickes, and has proved successful, and as the Utah and Northern Railroad now traverses this part of the Territory, and the Northern Pacific will soon be there, the days of costly transportation and high cost reduction have come to an end.

Soil and Vegetation.—In the western, central and southern portions of the State, the land along the valleys adjacent to the streams is rich and well adapted to agriculture, large crops of grain, vegetables, etc., being produced with little or no irrigation. The soil of the table lands is generally good, only requiring irrigation, for which abundant water can be had, to produce largely; while the foot hills are covered with an abundant growth of nutritious grasses extending to the timber line. In the northern and eastern portions of the country are vast tracts of so-called Bad Lands; but these have a much worse name than they deserve, many portions of them being covered with grasses more or less abundant, and affording grazing to large herds of buffalo, antelope, etc., and where there are stock farms near, to cattle also. The country is well timbered throughout, though, as we have already said, the soft woods, whether evergreen or deciduous, predominate largely. There are some small groves of ash, and large bodies of oak have lately been discovered on the head waters of Tongue river, near the southern boundary. The forests in the immediate vicinity of the settlements have suffered somewhat from the wanton depredations of settlers, who often destroy half a dozen small trees in obtaining one of requisite size for their purposes; but even in those sections, where the hillsides have been stripped entirely bare, there is a sturdy and flourishing second growth. The loss from forest fires is far greater than from any other source, but as the country becomes

more settled, and the Indians, who are most careless with fire, are kept upon their reservations, these will become less frequent. Until the present year (1880), there being no railroad for the transportation of grain out of the State, and the steam-boat navigation interrupted by falls and rapids, there was no export demand for Montana grain. This is all changed now; the Northern Pacific enters the territory from the east, and is already near Powder river, while the Utah and Northern is already at Helena, and will probably go further, and the Pend d'Oreille Division of the North Pacific, which communicates directly with the Pacific through the Columbia river, will soon be stretching down the valley of Clarke's Fork. With these three outlets the agricultural lands of Montana will be rapidly taken up, and there is no better land for agricultural crops in the world. The yield per acre of grain, vegetables, etc., with irrigation where it is needed, and without it where it is not, is very large, and the quality is of the best. Montana wheat especially is unexcelled; careful analysis has demonstrated that it contains a larger amount of both the flesh and fat producing constituents than any other, and the weight is from sixty-four to sixty-nine pounds to the bushel (the standard being sixty), and the average yield from thirty to forty bushels. The country will not only be self-sustaining in respect to its cereals, but will have for many years to come a large supply for exportation.

Zoölogy.—The larger game animals are abundant in Montana. This is one of the few remaining haunts of the buffalo, which is now found in considerable numbers both north of the Missouri and south of the Yellowstone. The moose is seen, though not in large numbers, in the mountain gorges. The elk roam in large herds on the mountain slopes and in the valleys, as do the two species of deer. The Big Horn or Rocky Mountain sheep and the antelope are at home all over the territory. Bears, badgers, gray wolves, panthers, beaver, otter, marten and mink, are found in the forests and streams in great numbers, and are largely captured for their pelts. In the mountain streams are an abundance of salmon trout, brook trout and grayling; and in their season the rivers and lakes are alive with wild geese,

brant, ducks of numerous species, and teal. The birds of prey are less numerous than farther south, though there are two species of eagle and many hawks and owls. Song birds are abundant.

Population.—The last Census gives the figure of 132,159, scarce one soul to each square mile of its rugged surface. It was but 40,000 in 1880, and only 20,000 ten years before. The whole vote in 1890 for Congress was 31,090.

Climate.—"In a general way," says Mr. Thomson P. McElrath, in his excellent little volume on the Yellowstone valley, just published, "the climate of Montana may be compared to that of the western sections of the Middle States. The summers are very warm, but, as a rule, the winters are far from being rigorous. The mean annual temperature of the valleys of Montana is 48°, which is higher than that of Massachusetts, Connecticut, Michigan, Wisconsin or Iowa, and only a little lower than that of Nebraska, Illinois and Ohio. Owing to the purity and dryness of the atmosphere, the heat, which is in the ascendancy during five months of the year, is seldom oppressive. There is a reduced tendency to perspire, and out-door exercise with the mercury at 100° is not nearly so uncomfortable as it is in the East under considerably lower conditions of caloric. A brief rainy season sets in annually, in April or May, lasting with considerably more persistency than in corresponding latitudes on the Missouri river, until the middle of July, under the refreshing influence of which vegetation receives a wonderful impulse. The same amount of rain distributed through the whole year would be of little value to the agriculturist. During the rest of the year rain seldom falls in large quantities." *

The average mean temperature of Helena, Montana, which is 1,000 feet higher than many of the valleys, is 44.5 degrees; that of six stations in Minnesota for the same time 41.6 degrees; the amount of rain and melted snow at Helena, 22.36 inches; in Minnesota, 27.89 inches. The average temperature of the winter months at Helena is 23.7 degrees; of Minnesota, 21.3 degrees.

The mean annual temperature of Maine and New Hampshire for six years (from 1866 to 1872) was 43.7 degrees; of Vermont, 43.2 degrees; that of the valleys of Montana, 48 degrees; yet half of Maine and nearly the whole of Vermont and New Hampshire are below the 45th parallel, which forms Montana's southern boundary. The mean annual temperature of Wisconsin for five years (1866 to 1871) was 44.8 degrees; of Michigan, 45.8 degrees; of Iowa, 46.4 degrees; Massachusetts and New York, 47.3 degrees; Connecticut, 47.6 degrees; Nebraska, 48.6 degrees; Illinois, 49.9 degrees; Ohio, 51.2 degrees.

The Missouri river at Helena is thoroughly open a month earlier each spring than at Omaha, 500 miles further south. The rainy season is in June, while the amount of rainfall is three-fourths that of Minnesota.

The winters are generally open, the long nights at that season being quite cold, but the days brilliant and far milder than would be expected in so high a latitude. The dryness of the atmosphere likewise prevents the cold from being as severely felt as it is in damp climates. The snow fall in the valleys is in most winters quite light, and after falling it is quickly melted or carried off by evaporation. The army officers stationed at Fort Keogh declare that until the past winter they have never enjoyed sleighing on the prairies for a week at a time, except occasionally in March, when the clear weather which had prevailed almost unbrokenly since the previous rainy season gave way to a short period of cold squalls accompanied by snow. These wind storms are liable to occur at any time during the year, resembling in the sudden lowering of temperature which accompanies them the chilling "northers" of the Gulf of Mexico, and occasionally equalling in their vehemence and abrupt subsidence the hurricanes which prevail on our South Atlantic coast yearly, from the middle of August to the middle of September.

Another phenomenon of a more agreeable character witnessed frequently in the winter season is the occurrence of the so-called "Chinook wind," a balmy zephyr, which, wafted from the Pacific Ocean and penetrating the gaps and passes of the Rocky Mountains, converts winter cold into summer warmth so suddenly that

sometimes a foot depth of snow will evaporate and disappear under its influence in the course of a single day. This is the realization of the "Japan current" theory, and while it prevails, it fully justifies that idea. One writer says: "I have known a foot of snow on the level to fall during the night and every patch of it to be melted before noon of the next day; and there are open spells in mid-winter, often lasting many days, when the trapper is comfortable without a coat over his woollen shirt." General Miles and others at Fort Keogh testify to similar facts. The winter of 1879-80 was exceptionally cold and protracted. From the end of November to the middle of March there was almost continuous sleighing in the lower Tongue river region, though the snow was not deep and the mercury, ranging in the vicinity of zero for several weeks, reached on one occasion, and probably only momentarily, on the night of December 24, 1879, as low a point as -57° . The Indians about Fort Keogh declared emphatically that they had never known the cold weather before to be so intense and so long continued. Notwithstanding the remarkably low temperature which prevailed for so long a period, no extraordinary discomfort was experienced beyond a few frozen fingers and toes on the part of travellers and soldiers unavoidably exposed on the bleak prairie roads, and not a single instance has been announced of cattle perishing from cold on their snow-covered pastures. The "Chinook wind" did not seem to manifest itself as efficiently as usual during that winter season. There was not much snow, however, in the valley twenty miles above Miles City; and eighty miles up the Tongue river the cold was not nearly so severe as that above recorded. Subjoined is a condensed summary never before published of the meteorological observations made at the United States signal station at Fort Keogh since the occupation of the valley by white residents. The observations were begun in the middle of January, 1879. The table shows the highest and lowest temperature recorded during each month, the average daily temperature, the range of temperature in each month, and the total rainfall.

Thermometric Observations at Fort Keogh, 1879-80.

MONTH.	TEMPERATURE.		Mean temper- ature.	Range.	Total rain- fall, Inches.
	Highest.	Lowest.			
1879.	°	°	°	°	
January (from 13th).....	36	11	32	25	.26
February	52	—15	23	67	.69
March.....	76	—25	40	101	.28
April.....	76	23	60	53	2.20
May.....	85	30	66	55	2.75
June.....	94	40	74	54	5.23
July.....	100	50	83	50	5.90
August.....	97	40	83	57	1.84
September.....	96	33	71	63	.44
October.....	90	12	58	78	2.47
November.....	94	—5	42	99	.11
December.....	42	—46	2	88	.58
1880.					
January.....	50	—18	...	68	.32
February.....	54	—19	...	73	.17
March.....	72	—24	...	96	.51

Annual range, 146 degrees.
Total rainfall and melted snow in 1879, 22.75 inches.

The figures in the fifth column form a more effective refutation of the "barren land" theory than any argument that could be framed in words alone. But the collateral facts speak yet more emphatically than the figures!

In further illustration of the climate, we add the weather report from Fort Benton, Montana, which lies on or near the forty-eighth parallel:

Weather Report at Fort Benton from January 1, 1872, to July 1, 1879.

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	First six months 1879.
No. of fair days.....	305	291	277	289	286	300	195	110
No. of cloudy days.....	60	74	88	76	79	65	169	70
Mean temperature of year..	37.25	42°	42° 5	43° 5	30° 75	41° 00	48° 00	
Spring	11°	25°	13°	17°	14°	24°	37°	21°
Summer	48°	52°	56°	55°	54°	50°	55°	58°
Autumn.....	61°	63°	68°	66°	61°	58°	64°	
Winter	29°	28°	33°	36°	30°	32°	36°	
	In.	In.	In.	In.	In.	In.	In.	Inches.
Average annual fall of rain or melted snow.....	17.00	12.72	23.76	21.84	20.64	12.72	20.40	21.60

This shows an average of 275 fair days for each year.

We also give from the Surveyor-General's office in Helena the following record of temperature and weather in 1878-9:

Record of Temperature at Helena, Montana, from July, 1878, to June, 1879, inclusive, taken at the office of the Surveyor-General for Montana.

Month.	Highest.	Lowest.	Mean.	Clear days.	Cloudy days.	Snowy days.	Rainy days.
	°	°	°				
July, 1878.....	98	50	74	24	1	.....	6
August, 1878.....	94	51	76 $\frac{2}{3}$	28	2	.....	1
September, 1878.....	85	30	54 $\frac{1}{6}$	16	10	1	3
October, 1878.....	76	12	46 $\frac{2}{3}$	14	12	1	4
November, 1878.....	62	22	41 $\frac{2}{3}$	23	5	2	
December, 1878.....	52	0	27 $\frac{1}{3}$	9	15	7	
January, 1879.....	52	—12	23 $\frac{1}{8}$	23	5	3	
February, 1879.....	62	—11	26	19	4	5	
March, 1879.....	71	8	38 $\frac{1}{3}$	24	4	3	
April, 1879.....	70	27	49	16	13	.....	1
May, 1879.....	77	30	53 $\frac{1}{3}$	14	12	.....	5
June, 1879.....	80	43	59 $\frac{1}{5}$	12	5	.....	13
For the year.....	98°	—11	44.6	222	88	22	33

We add also the—

Meteorology of Virginia City, Montana, 1878.

YEAR AND MONTHS.	TEMPERATURE.				MOISTURE.		BAROMETER.	WINDS.
	Maximum Temperatures.	Minimum Temperatures.	Mean Temperatures.	Range of Temperature.	Annual and Monthly Rainfall.	Mean Humidity.	Annual and Monthly Mean Pressure.	Prevailing Winds in the Order of their Frequency.
	°	°	°	°	inches.	per cent.	inches.	Direction.
Year.....	92	—15	42.2	107	20.06	54.0	29,705	Calm, S. E., W., S. W., N. E.
January.....	43	—4	23.1	47	0.45	62.5	29,661	Calm, S. E., S. W., N. E.
February.....	49	10	27.9	39	0.62	63.2	29,536	Calm, S. W., S. E., W.
March.....	64	11	37.8	53	0.91	58.2	29,657	S. E., calm, S. W., W.
April.....	65	19	39.8	46	1.83	57.0	29,505	W., S. E., S. W., E., calm.
May.....	70	25	45.5	45	5.13	54.8	29,668	Calm, S. E., N. E., W., S. W.
June.....	85	35	58.6	50	3.78	48.0	29,766	Calm, S. E., W., N. W., N. E.
July.....	92	42	67.2	50	0.88	36.9	29,745	Calm, S. E., W., S., N. E.
August.....	90	50	69.2	40	2.16	45.4	29,808	Calm, S. E., N. E., E., W.
September.....	88	26	48.9	62	1.36	54.5	29,771	Calm, S. E., N. W., N. E.
October.....	64	9	38.9	55	0.98	59.7	29,734	Calm, W., N. W., S. W.
November.....	59	11	35.1	48	0.31	54.0	29,777	Calm, S. E., W.
December.....	46	—15	17.7	61	0.65	72.0	29,785	W., calm, S. W., N. W.

Mining.—It is matter of history that in 1852, a Scotch half-breed from the Red River country, returning from California,

found gold on Gold creek, in Deer Lodge county. This was, of course, a placer, though apparently not a very rich one. Others who had heard of this find, in 1856 prospected Benetsee creek, in the same vicinity, and found some gold, as did another party who came thither in 1858; but being without provisions or tools, and the Indians being hostile, they soon abandoned the country. In 1860, Henry Thomas, better known as "Gold Tom," sunk a shaft down to the bed rock on Benetsee creek, a depth of thirty feet; but owing to his poverty and disadvantages for work, having but little food and but few tools, he only made about \$1.50 a day. From 1860 to 1863, the Stuart brothers, James, Granville and Thomas, a Mr. Anderson, M. Bozeman, S. T. Hauser, F. Louthan and others, were the principal pioneers in gold discoveries in what is now known as Southwestern Montana. The earlier discoveries were all of placers, some of them exceedingly rich. Alder gulch, on which Virginia City is situated, was probably the richest placer ever discovered in any part of the world. At first the product was from \$100 to \$200 a day for each man, and in the first five years after its discovery Alder gulch and its tributaries yielded on an average \$8,000,000 a year. The total product from this single placer up to the end of 1876 was \$70,000,000. Latterly it has fallen off to \$600,000 or \$800,000 a year. Silver Creek gulch, about twelve miles from Helena, and Last Chance gulch, upon which the town of Helena itself is situated, have also proved very rich placers, the two yielding about \$16,000,000 since their discovery. Mining is still continued in these and other placers, and the advent of railroads into the region has caused machinery and timber to be brought there at so much less expense, and the gold product sent to market at so much cheaper rates, that hydraulic mining on a most extensive scale is to be resorted to in all the best placers. The total product of gold from placer mining in the Territory has been variously estimated at from \$120,000,000 to \$140,000,000. It is difficult to determine the exact amount, as the returns of the placers and the quartz veins or lodes have not in all cases been kept separate. It is probably not less than \$125,000,000.

Quartz mining for gold began in Montana almost simultane-

ously with that of the placers. The first lode located was discovered near Bannock, in Beaverhead county, in 1862, and the mine was called the Dakota. Mr. Warner, in his "History and Directory of Montana," says that the decomposed quartz found near the surface of this vein was taken down the hill on which it was situated, to the creek, on pack animals, and the gold was there washed out. In the spring of 1863 a small water-mill for crushing this quartz was completed. The stamps were made of old wagon-wheel tires welded together and had wooden stems. Other mills were subsequently erected, and gold in small quantities has been taken from this and other mines in the vicinity almost ever since. Gold quartz ledges were discovered in the vicinity of many other placer mines, and the ores have been worked on a small scale in different parts of the Territory. A few of the lodes have produced large quantities of bullion. The chief obstacles to the development of the gold quartz mines of Montana have been lack of capital, bad management due to want of experienced superintendents, and the enormous cost of machinery. When freights from Chicago or St. Louis were never lower than five cents, and frequently as high as ten, twelve or fifteen cents a pound, it cost two or three times as much to bring machinery into Montana as was paid for it at the place where it was manufactured, and a man not only had to have a good mine but considerable ready capital in order to be able to develop it and bring it into a paying condition. Some of the most promising gold mining enterprises in this Territory have also failed on account of ignorance or extravagance in their management, and these failures have deterred capitalists, who at best were timid about investing their money in a country so difficult of access, from becoming interested even in the good properties.

The principal mines of gold in quartz lodes are almost as numerous as the placers. After the Dakota, which still yields a fair amount, are the Union lode and others in Lewis and Clarke county, which have yielded about \$3,000,000; the Atlantic Cable lode, in Deer Lodge county, a very rich mine; while there are mines which have paid well for a number of years at Unionville and the Park, four miles from Helena, at Silver Star, Summit,

Alder, Meadow Creek, Iron Rod, Bannock, Radersburg, Pony, Boulder and Highland. But the richest quartz gold mines in Montana are those of the Stemple District, fifteen to twenty miles northwest of Helena. The famous Penobscot and other extensions of the Snow Drift lode are probably the most valuable gold quartz mines in the world. Mr. Nathan S. Vestel first developed the Penobscot mine, which is on the summit of the main range of the Rocky Mountains. His first efforts in 1877 did not meet with much encouragement, and late in the year he found himself \$7,000 in debt and in doubt where he could obtain the means of payment. But the three shafts he had sunk on the Penobscot claim began to show good results, and the first clean-ups from a little five stamp mill, which had been brought there, gave him \$20,000, with which he paid his debts and had \$13,000 over. The yield now increased rapidly, some of the ore yielding \$1,000 in gold to the ton, and the average being more than \$100 to the ton aside from the waste, which was considerable, as it was in very fine particles. In the summer of 1878 he sold the mine to Mr. William B. Frue, of Detroit, on terms from which he realized \$350,000. It has proved a very profitable investment, yielding about \$23,000 a month. Mr. Vestel immediately commenced developing another mine, 900 feet below the Penobscot, which is yielding about \$12,000 a month. It is called the Belmont. Other mines of this district and vicinity are the Blue Bird, Whip-poor-will, Black Hawk, Viola, Grey Eagle, Emma Miller, Mount Pleasant, Green Northern Light, Piegan, Humbug and Long Tom. These are all paying largely. The gold quartz mines have yielded since 1864 over \$20,000,000; of the \$162,000,000 of the precious metals sent to market to the end of 1879, about \$145,000,000 are gold and the remainder silver.

The silver ores of Montana are mostly refractory, and have proved difficult of reduction, and in the past would only pay when they were very rich. Now the machinery, and concentrating, stamping, smelting, wasting, chlorodizing, amalgamating and leaching works are all in the Territory and easily accessible by railway, and the silver ores, which are, many of them, very rich, will yield great profits to the mine-owners and ore reducers.

The most important of these works are those of the Alta Montana Company, which owns several mines also, at Wickes, about twenty-five or thirty miles southwest of Helena, and about midway between the Utah and Northern Railroad and the Rocky Mountain Division of the Northern Pacific. When these works were first established they proved a failure, but they have now been taken up by an enterprising company from the East, with large capital, and are achieving a grand success. The Colorado and Boulder Districts have a large number of silver mines, with very rich lodes, many of which will contribute to the supply of ores to be reduced at Wickes. Another extensive silver lode, the earliest one discovered in Montana, is in the district of Phillipsburg, in Deer Lodge county, nearly 100 miles west-southwest of Helena, in the elevated valley between the main Rocky Mountain chain—the “Great Divide”—and the Bitter Root Mountains. This is on the surveyed route of the Rocky Mountain Division of the Northern Pacific. The Speckled Trout, the Algonquin and the Hope mine are the largest and most promising mines in this district. These have yielded somewhat largely of argentiferous galena, with considerable sulphur and other combinations. The yield is from seventy-five to ninety ounces of silver to the ton. Owing to heavy expenses, these mines have not proved very profitable till recently. But the most remarkable of all the mining districts is Butte and its vicinity, also in Deer Lodge county, but east of the Great Divide. The silver ores were first discovered in 1864 (or perhaps earlier), but the working of them could not be made profitable on account of their refractory nature and the great cost of transportation. They again attracted attention in 1874-5, and Butte City has a population of about 3,500, and in its immediate vicinity are twenty or more mines, all yielding well. The ores are of different kinds, and require different processes for their reduction. There is a silver-gold belt, with no copper, but some galena and oxide and carbonate of manganese. Above the water-line this is free milling, and can be reduced with a moderate amount of labor. Below the water-line it is baser, and requires chloridization and roasting for its reduction. The silver predominates, but there is a small

amount of gold mixed with it. The yield ranges from twenty-five to one hundred and eighty ounces of silver to the ton. One mile east of this is a belt of copper ore of great richness, but containing some arsenic. The yield is about 400 pounds to the ton. In a contrary direction, a mile and a half west of the silver-gold belt, just beyond the Butte, is an extensive lode of chloride of silver, on which several mines have been opened, but though apparently very rich, it has not yet been largely developed. There are now extensive reverberatory furnaces for smelting these ores, and when reduced to a matte carrying from 600 to 900 ounces of silver to the ton, they are sent to Denver to be parted. Most of the mines are what are known as surface mines; that is, they do not penetrate below the water-line. Indeed, it was found that the ores rapidly depreciated in quality as they approached this line. The owners of the Alice mine, one of the best of the surface mines, had the courage, against the opinion of all the other miners, to go below the water-line, and, following the vein, to ascertain whether it would not improve as they reached deeper levels. They have expended \$600,000 on this experiment, all of which, however, had been made out of the mine, and at 300 feet depth found the ore much better, and at 400 and 500 feet they were richer than at the surface. Encouraged by this they have proceeded to strike the vein at a depth of 800 feet. The silver deposits at Butte are believed to be more extensive than any yet discovered in Montana. The production of silver and gold at this camp to September, 1880, had been somewhat more than \$4,000,000, and is likely to be largely increased.

Glendale and the Trapper district, situated in and around the Trapper Creek Cañon, in Beaverhead county, but on the eastern side of the "Great Divide," has come into notice within the last four years, and is regarded by Mr. Z. L. White as one of the two successful silver camps of the Territory, Butte being the other. The mines which have proved most profitable are on White Lion Mountain, about 9,000 feet above the sea. The ore is found in a wide belt of dolomite or soft white limestone, lying between two limestone strata of a much harder texture. The bulk of the ore in these mines is decomposed, earthy, and easily

mined with pick and spade. It consists of silver, copper, sulphur, lead, arsenic, antimony, aluminum and silica, with occasionally a little undecomposed galena. It yields on an average from eighty to one hundred and twenty ounces of silver to a ton.

There are several copper mines in the Territory, one large deposit of copper ores being at Copperopolis, on the head waters of the Musselshell river. There is also a beginning of iron mining in the Territory. Coal mining is becoming a profitable pursuit along the Missouri and Yellowstone Divisions of the Northern Pacific Railroad. The mining products of Montana in 1879 were about \$10,000,000—an amount which will soon be doubled.

It is worthy of notice that all the vein and lode mining, whether of gold or silver, has been confined to the southwestern section of Montana, a region lying west of a line drawn southward from the junction of the Dearborn river and the Missouri, and striking the Yellowstone at or near Fort Ellis, thence along the Yellowstone to the Yellowstone National Park. It comprises both slopes of the "Great Divide," extends across the valleys beyond, and includes the eastern slope of the Bitter Root Mountains. That this is not the only part of the Territory which contains gold deposits appears from the fact that rich placers have been found in Missoula county, northwest 175 miles or more from Helena, and east and northeast of the Missouri river as far as the slopes of the Bear's Paw Mountains, northeast of Fort Benton; and where there are placers the gold and silver lodes are not far off. We may look confidently for further discoveries of both gold and silver in the detached and isolated mountains of the Territory, and very possibly extensive gold lodes in the Powder river range, in the southeast of the Territory, that range having strong geological affinities with the Black Hills. There have been some gold and silver lodes of rich promise recently discovered on Clarke's fork of the Yellowstone, about the middle of the Crow Indian reservation, and negotiations are now in progress with the Crows to cede this part of their reservation.

Agricultural Productions.—Writers on Montana have generally estimated its arable lands at 15,000,000, or at the utmost

16,000,000 acres ; but the recent reports of the Surveyor-General of the Territory, and of the missionaries and travellers who have been up the valley of the Yellowstone and through Eastern Montana indicate that there are millions of acres which, with moderate irrigation, for which the facilities are abundant, will yield immense crops, and in fact a part are already yielding crops which astonish all beholders. Of the agricultural productions of the valleys and benches of Western Montana, the affluents of Clarke's fork of Columbia river, of the Jefferson, Madison and Gallatin, and of the Yellowstone and the upper Missouri, we will let Mr. Zimri L. White, the cautious and able correspondent of the *New York Tribune*, tell us :

“The agricultural lands of Montana are the valleys. The main range of the Rocky Mountains extends through the Territory generally in a northerly and southerly direction, and from this there are spurs and auxiliary ranges extending in all directions and covering nearly the whole face of the country except in the north and east, where there are extensive elevated plains. Between these ranges flow hundreds of beautiful clear-water streams, some large and some small, and bordering these rivers and creeks are fine rich valleys from one to ten or twenty miles in width. The soil in the valleys is an alluvial deposit, and the land generally has a gentle and regular slope from the bed of the stream to the foot of the bench which separates the valley from the foot-hills. So true is this slope that in almost every instance water taken out in a ditch parallel with the stream can be made to flow over every foot of land below it. The benches, of which there are sometimes several and sometimes only one, are simply continuations of the valley at a higher elevation. They frequently look like great terraces rising one above the other, and where the quantity of water in the stream and the fall are sufficient to make irrigation possible, the bench lands are found to be equally productive with the valleys proper. Behind the benches rise the foothills, with their rounded, grass-clad tops, now extended for miles and forming the divide between two streams, and again seeming to support a rocky, precipitous ridge that rises beyond them.

Manufactures.—Montana is too new a country and has too small a population to have any very extensive manufacturing establishments. There are stamping, smelting and other reduction mills at Helena, Bozeman, Wickes, Butte City, Virginia City and other points in the Territory; saw-mills and flouring-mills at several of the larger towns, and the usual run of small manufactories in most of these places. Probably twelve or fifteen million dollars would cover the products of all the manufacturing establishments yet in existence.

Objects of Interest.—About one-tenth of the Yellowstone National Park is within the bounds of Montana; but as nearly seven-eighths of this great wonder of the world belongs to Wyoming, we reserve our description of it for that Territory. But it is not the Yellowstone Park alone which attracts the attention of the tourist. The whole valley of the Madison river, as well as that of the Upper Yellowstone, is full of wonders, and the valley of the Upper Missouri and the northern portion of the valley of Clarke's fork of the Columbia river. In the Madison and the Yellowstone, cañon succeeds cañon, and wild, rocky waterfalls are too lofty to be run by any boat, and within such narrow bounds that there is no passage there for any human being, and they can only be viewed from above. One of these cañons in the Madison is fifteen miles in length, and its walls are from 600 to 900 feet in height, while the water leaps over a succession of rapids and falls. No human being has ever passed through it. Not far off are beautiful crystal lakes, which attract great numbers in the season. The geyser formation extends over all this region, and among the most remarkable examples of it are the Deer Lodge Mineral Springs, eighteen miles north of Deer Lodge, some of which are really geysers, while others have formed cones of their deposits thirty feet in height and fifty feet in diameter at the base, from the apex of which flows a large warm spring. This is surrounded by forty other springs, ranging in temperature from 115° to 150°. The cañons and falls on the Upper Missouri are very beautiful and grand. We can only name "The Gate of the

Mountains" and the "Great Falls," eighteen miles north of Helena, "Atlantic Cañon," "The Bear's Tooth," "The Mysterious Thunder," supposed to be caused by hidden geysers in the mountains, "The Devil's Slide" and "The Devil's Watch-Tower;" and in the northwest, the Flathead Lake Region with its Twin Cascades.

Indian Reservations and Population.—The Territory was regarded as the best place to which to banish the Blackfeet, Crows, Assiniboinés, Gros Ventres and Yanktonnais, after the terror inspired among the settlers by the terrible massacres in Minnesota in 1862–3, had made their longer stay in a new and rapidly growing State intolerable and impossible, and so they were removed to immense reservations north of the Missouri river and south of the Yellowstone, in 1867 and 1868, in the expectation that there they would be able to remain without molestation. Little did the Indian Office then dream that within ten or twelve years this very region would be found to be the garden spot of American agriculture, and that mines of fabulous wealth would be discovered among the mountains which then seemed to be so forbidding. But so it was; and when, a year or two later, the Flatheads, Pend d'Oreilles and Kootenais were in need of a home, one was assigned to them also within the limits of Montana. The United States government was lavish in its gifts of land to these tribes—34,156,800 acres, or $\frac{37}{100}$ of the whole area of the Territory, was made over to them, including nearly all the land north of, and more than one-half of the region south of the Yellowstone, extending to the Wyoming border. The land north of the Missouri, though some of it unfit for cultivation, is for the most part good grazing land, and the mountain slopes and river bottoms contain gold lodes and extensive placers; but the region south of the Yellowstone is the garden of the Territory for productiveness, and contains also extensive lodes of silver and gold, especially on Clarke's fork of the Yellowstone, Rosebud creek, and the Upper Yellowstone itself. At and around the five agencies on these reservations, viz.: the Blackfeet Agency, Crow Agency, Flathead Agency, Fort Peck Agency, and Fort Belknap

Agency, there are congregated 21,670 Indians, of whom 3,470 are Crow Indians, occupying the reservation south of the Yellowstone; 16,842 Blackfeet, Assinaboines and other Sioux bands, and 1,338 Flatheads and other Pacific tribes. Of the whole number only 1,531, about seven per cent., can be called civilized, so far as the assumption of citizen's dress is concerned, and but 475 male Indians were engaged in civilized pursuits. The absurdity of giving such a vast tract to these vagrant and barbarous tribes will be appreciated if we notice that they are allowed over 1,700 acres to every Indian, man, woman or child. Now that the buffalo is so rapidly disappearing that it has already ceased in nearly all parts of the continent to be the dependence of the Indian tribes for game and for its peltries, it is well worth while to inquire whether some occupation cannot be devised for the Indian which shall enable him to do something towards earning his own livelihood without occupying, or, rather, withholding from occupation by others, a Territory as large as the State of Illinois. We would not have the Indian wronged, but the lands of the earth are too precious to be held by those who cannot and will not cultivate or use them for human subsistence, and will not allow others to do so.

CHAPTER XIV.

NEBRASKA.

NEBRASKA, one of the States of the central belt of "Our Western Empire," lying between the parallels of 40° and 43° north latitude, and between $95^{\circ} 20'$ and 104° of west longitude from Greenwich. It is bounded on the north by Dakota; on the east by the Missouri river, which separates it from Iowa and Missouri; on the south by Kansas and Colorado, and on the west by Colorado and Wyoming. Its area, according to the United States Land Office, is 75,995 square miles, or 48,636,800 acres. Its greatest length from east to west is 412 miles, and its breadth

from north to south 208 miles. It is larger than all New England and New Jersey, and as large as Ohio and Indiana together. The Missouri river not only forms its entire eastern boundary, but in conjunction with the Niobrara, one of its larger tributaries, and the Keya Paha, an affluent of that stream, gives a riverine boundary to nearly one-half of its northern border.

Surface of the Country—Gradual Descent from West to East—Rivers, Bluffs, Hills, Valleys.—The State is called prairie. So it is, in the sense of the word which means meadow; but not in that secondary sense which implies a land of uniform flatness. In real truth, Nebraska is a part of the lowest eastern grass-clothed slope of the Rocky Mountains. The eye alone will make no observer aware of this fact. Nevertheless, from the eastern to the western boundary of Nebraska, there is a gradual and uninterrupted rise of the land of about seven feet to the mile in Eastern Nebraska, and from that to ten feet in the west; and thus it is that while the land on the eastern boundary is 910 feet above sea-level, on the western boundary it is about 5,000. The surface form of the State is, of course, made by the rivers. The eastern front of the country shows bold, wooded bluffs to the Missouri, their outlines being cut and scarped into fantastic and picturesque forms by the washing water. West of the Missouri bluffs, except on the table lands, there is no flat, but a land of many changing forms—now broad bottoms, bounded by low hills; now picturesque bluffs, and, especially in the grazing region, ravines sometimes as rugged as the gulches in the gold fields. In the northwestern part of the State, in the region lying between the sources of the Middle Loup fork and the Niobrara river, there are extensive sand hills, and those clay deposits, cut into the most fantastic forms by the erosion of the mountain streams. These are the "Nebraska Bad Lands," and are connected, both geologically and geographically, with the Dakota "Bad Lands," on and near the White Earth river, and between that river and the Big Cheyenne.

These "Bad Lands" are uninhabitable, but they are very interesting for their fossils, of which we shall have more to say under the Geology of Nebraska.

Now and again a river flows full to the bank, from which the bottom—from a mile to four or more miles wide—spreads out on either hand; but generally the streams run in deep beds, the high, steep banks and the narrow first bench being thickly clothed with timber. The general ascending lay of the land is broken from west to east by three main drainage channels. On the northern boundary of the State are the Niobrara and the Missouri rivers, of which latter the Niobrara is an affluent.

The Niobrara has many tributaries, some of them of considerable size; and several of them, as their names imply, have many rapids and waterfalls.* The Platte, a winding, shallow, spreading stream, has the sources of both of its main streams, the North and South forks of the Platte, far up the main range or Great Divide of the Rocky Mountains in Central Colorado; the North fork also traversing a great extent of territory in Wyoming; both forks cross Nebraska from west to east to their point of junction at North Platte. Before the division, the Platte river receives two large tributaries, the Loup Fork river, which, with its three branches, North, Middle and South, traverses a large territory, and the Elkhorn, which drains Northeastern Nebraska. On the south bank, neither the Platte nor the North Platte receive any considerable streams. The South Platte receives on its north bank Lodge Pole creek, in the valley of which the Union Pacific road is constructed for 150 miles. From fifty to eighty miles south of the Platte, the Republican river, the largest tributary of the Kaw or Kansas river, having its sources in Eastern Colorado, traverses the southern and southwestern counties of the State, receiving three large affluents, Medicine Lake creek, White Man's fork and Rock creek, on its northern bank, and an infinitude of small streams on both banks. Other smaller but considerable tributaries of the Kansas drain the southeast of the State. The general direction and flow of all these rivers is to the southeast. In their gradual descent from the lofty plateau at the west of the State, the rivers and streams, in seeking the lowest level,

* *Eau qui Court*—"the water that leaps"—*Mini Chadusa*, or Rapid creek, Antelope creek, the Rapid river, are a few of the names of these affluents.

have cut their way through the soft and easily eroded deposits, and have worn away their banks to such a degree as to give the appearance of high bluffs along their banks, when in reality no such bluffs exist; but the stream has eroded for itself a channel at a lower level than that of the surrounding country. Such is the topography of Nebraska in barest outline; and, with the map before him, the reader can fill in the details. He can imagine the great plain ascending to higher altitudes as the mountains are approached; the rivers, west to east, making three great valleys, and two elevated divides separating the valleys; and, finally, the smaller streams exhibiting the land as broken into an almost infinite number of gently undulating hills and valleys—with great table lands on the summits—the trend of which is southeast.

Geology and Mineralogy.—The geological structure of the State is very simple. In the southeast a triangular tract, extending west as far as where the Little Blue river crosses the southern boundary of the State, and having the apex of the triangle at the point where the forty-second parallel of latitude intersects the Missouri river, is distinctly identified with the upper carboniferous formation. It is covered to a depth of from thirty to ninety feet by a yellowish marl (the loess or surface deposit described by Professor Hayden), but the rocks below belong to the coal measures. There are thin strata of coal of good quality, but ranging in thickness from five to twenty-two inches—not sufficiently thick to pay for expensive mining, while clays, limestones and sandstones belonging to the carboniferous era make up the remaining thickness of the coal measures, which aggregate 120 feet or more. The geologists believe this deposit to be the western rim or margin of the great coal basin of Missouri and Iowa, and think that on this border or rim the coal has been subjected to such pressure that it will be found too thin for profitable mining. West of these coal measures is a narrow belt of Permian rocks, and to this succeed the cretaceous deposits, having a breadth of seventy or eighty miles. West of this the whole surface rocks and soil of the State belong to the tertiary period. In the southwest the tertiary formation has large deposits of lignite of excellent quality, which will probably supply a large portion

of the demand of the State for coal. Of the loess or yellowish marl which forms the superficial deposit over the greater part of the State, we may remark, that this deposit, which is quaternary rather than tertiary, is supposed to be the sediment deposited by the great lakes, one of them in Nebraska and Iowa being estimated as 500 miles long, and from fifty to two hundred miles wide, which covered this whole region after the close of the last glacial period. Into and through the greatest of these lakes the Missouri, then, as now, the muddiest of rivers, poured its vast flood of yellow waters. As the land gradually rose, this immense lake drained off its surplus water through the Missouri river, became a vast marsh, and eventually, as the rivers cut deeper and deeper through this loess deposit, the land became dry and solid. Of this loess, Professor Aughey, the State Geologist, says:

“The loess deposit is in some respects one of the most remarkable in the world. Its value for agricultural purposes is not exceeded anywhere. It prevails over at least three-fourths of the surface of Nebraska. It ranges in thickness from five to one hundred and fifty feet. Some sections of it in Dakota county measure over 200 feet. At North Platte, 300 miles west of Omaha, and on the south side of the river, some of the sections that I measured ranged in thickness from 125 to 150 feet. From Crete, on the Burlington and Missouri River Railroad, west to Kearney, on the Union Pacific Railroad, its thickness for ninety miles ranges from forty to ninety feet. South of Kearney, and for a great distance west, along the Union Pacific Railroad, as far as to the Republican, there is a great expanse of territory, covered by a great thickness of this deposit. I measured many sections in wells over this region, and seldom found it less than forty, and often more than sixty feet in thickness. Along the Republican, I traced the formation almost to the western line of the State, its thickness ranging from thirty to seventy feet. One section north of Kearney, on Wood river, showed a thickness of fifty feet. The same variation in thickness is found in the counties bordering on the Missouri. One peculiarity of this deposit is that it is almost perfectly homogeneous throughout, and of almost uniform color,

however thick the deposit or far apart the specimens have been taken. I have compared many specimens taken 300 miles apart, and from the top and bottom of the deposits, and no difference could be detected by the eye or by chemical analysis.

“The physical properties of the loess deposits are also remarkable. In the interior, away from Missouri, hundreds of miles of these loess deposits are almost level or gently rolling. Not unfrequently a region will be reached where, for a few miles, the country is bluffy or hilly, and then as much almost entirely level, with intermediate forms. The bluffs that border the flood-plains of the Missouri, the Lower Platte and some other streams, are sometimes gently rounded off. They often assume fantastic forms, as if carved by some curious generations of the past. But now they retain their forms so unchanged from year to year, affected neither by rain nor frost, that they must have been molded into their present outlines under circumstances of climate and level very different from that which now prevails. For all purposes of architecture this soil, even for the most massive structures, is perfectly secure. On no other deposits, except the solid rocks, are there such excellent roads. From twelve to twenty-four hours after the heaviest rains, the roads are perfectly dry, and often appear, after being travelled a few days, like a vast floor formed from cement, and by the highest art of man. Yet the soil is very easily worked, yielding readily to the spade or the plow. Excavation is remarkably easy, and no pick or mattock is thought of for such purposes. It might be expected that such a soil would readily yield to atmospheric influences, but such is not the case. Wells in this deposit are frequently walled up only to a point above the water-line; and on the remainder the spade-marks will be visible for years. These peculiarities of the loess deposits are chiefly owing to the fact that the carbonate of lime has entered into slight chemical combination with the finely comminuted silica. There is always more or less carbonic acid in the atmosphere which is brought down by the rains, and this dissolves the carbonate of lime, which then readily unites with the silica, but only to a slight extent, and not enough to destroy its porosity. Though much of the silica is microscopically minute,

it has largely preserved its angular structure, and this of course aids the slight chemical union that takes place between it and the carbonate of lime. Had there been more lime and iron in this deposit, and had it been subjected to a greater and longer pressure from superincumbent waters, instead of a slightly chemically compacted soil, it would have resulted in a sandstone formation incapable of cultivation. There is not enough clayey matter present to prevent the water from percolating through it as perfectly as through sand, though a great deal more slowly. This same peculiarity causes ponds and stagnant water to be rare within the limits of this deposit."

In the northwestern part of the State, the region of the "Bad Lands," to which we have already referred, the loess is not a surface deposit. The hills, "Great Hills," as they are called on some of the maps, are either composed of loose-moving sand which is blown by the winds into round, conical hills with considerable regularity—hills sometimes covered scantily with tufts of grass, but oftener with the yuccas or Spanish needles or some of the custi; or the fantastic forms of the clay and soft tertiary limestones, cut by the water-courses into the semblance of ruined cities, towers, temples and columns, and often covered with sparkling alkaline crystals. This region of "Bad Lands" occupies, according to Professor Hayden, an area of about 20,000 square miles on both sides of the Niobrara river. There are many little lakes or ponds in this region, some salt, some alkaline, and some very pure and fresh. This whole tract abounds in fossils of the most remarkable character. While these lands are geologically connected with the "Bad Lands" on the White Earth river in Dakota, it is a very interesting fact that the fossils of the Dakota lands belong to an earlier period than those of the Nebraska lands, and that the two seem to have had hardly any animals common to both. These regions have been the favorite hunting-ground for fossils of Professors Leidy and O. C. Marsh. Of the Nebraska fossils Professor F. V. Hayden says:

"If we pass for a moment southward into the valleys of the Niobrara and Loup fork, we shall find a fauna closely allied, yet entirely distinct from the one on White river, and plainly inter-

mediate between that of the latter and of the present period; one appears to have lived during the middle or miocene tertiary period, and the other at a later time in what is called the pliocene. In the later fauna were the remains of a number of species of extinct camels, one of which was of the size of the Arabian camel, a second about two-thirds as large, also a smaller one. The only animals akin to the camels, at the present time in the western hemisphere, are the llama and its allies in South America. Not less interesting are the remains of a great variety of forms of the horse family, one of which was about as large as the ordinary domestic animal, and the smallest not more than two or two and a half feet in height, with every intermediate grade in size. There was still another animal allied to the horse, about the size of a Newfoundland dog, which was provided with three hoofs to each foot, though the lateral hoofs were rudimental. Although no horses were known to exist on this continent prior to its discovery by Europeans, yet Dr. Leidy has shown that before the age of man this was emphatically the country of horses. Dr. Leidy has reported twenty-seven species of the horse family which are known to have lived on this continent prior to the advent of man—about three times as many as are now found living throughout the world.

“Among the carnivoræ were several foxes and wolves, one of which was larger than any now living; three species of hyænodon—animals whose teeth indicate that they were of remarkably rapacious habits; also five animals of the cat tribe were found, one about the size of a small panther, and another as large as the largest wolf. Several of the skulls of the tiger-like animals exhibited the marks of terrible conflicts with the cotemporary hyænodons.

“Among the rodents were a porcupine, small beaver, rabbit, mouse, etc.

“The pachyderms, or thick-skinned animals, were quite numerous and of great interest, from the fact that none of them are living on this continent at the present time, and yet here we find the remains of several animals allied to the domestic hog, one about the size of this animal, another as large as the African

hippopotamus, and a third not much larger than the domestic cat.

"Five species of the rhinoceros roamed through these marshes, ranging from a small, hornless species, about the size of our black bear, to the largest, which was about the size of the existing unicorn of India. No animals of the kind now inhabit the western hemisphere.

"Among the thick-skinned animals were the remains of a mastodon and a large elephant, distinct from any others heretofore discovered in any part of the world. Dr. Leidy says that 'it is remarkable that among the remains of mammals and turtles there are none of crocodiles. Where were these creatures when the shores of the ancient Dakotan and Nebraskan waters teemed with such an abundant provision of savory ruminating hogs?' During the tertiary period Nebraska and Dakota were the homes of a race of animals more closely allied to those inhabiting Asia and Africa now, and from their character we may suppose that during that period the climate was considerably warmer than it is at present. The inference is also drawn that our world, which is usually called the new, is in reality the old world, older than the eastern hemisphere.

"Ever since the commencement of creation, constant changes of form have been going on in our earth. Oceans and mountains have disappeared, and others have taken their place. Entire groups of animal and vegetable life have passed away, and new forms have come into existence through a series of years which no finite mind can number. To enable the mind to realize the physical condition of our planet during all these past ages is the highest end to be attained by the study of geological facts. It has been well said by an eloquent historian that he who calls the past back again into being enjoys a bliss like that of creating.

"We may attempt to form some idea of the physical geography of this region at the time when these animals wandered over the country, and to speculate as to the manner in which their remains have been so beautifully preserved for our examination. We may suppose that here was a large fresh-water lake during the middle tertiary period; that it began near the southeastern side

of the Black Hills, not large at first nor deep, but as a marsh or mud-wallow for the gigantic pachyderms that lived at the time; that as time passed on it became deeper and expanded its limits until it covered the vast area which its sediments indicate. We cannot attempt to point out in detail all the changes through which we may suppose, from the facts given us, this lake has passed, during the thousands of years that elapsed from its beginning to its extinction, time long enough for two distinct faunæ to have commenced their existence and passed away in succession, not a single species passing from one into the other. Even that small fraction of geological time seems infinite to a finite mind. We believe that the great range of mountains that now lies to the west of this basin was not as lofty as now; that doubtless the treeless plains were covered with forests or grassy meadows, upon which the vast herds of gregarious ruminants cropped their food. Into this great lake on every side poured many little streams from broad valleys, fine ranging ground for the numerous varieties of creatures that existed at that time. Large numbers of fierce carnivorous beasts mingled with the multitudes of gregarious ruminants, constantly devouring them as food. As many of the bones, either through death by violence or natural causes, were left in the valleys, they would be swept down by the first high waters into the lake, and enveloped in the sediments at the bottom. As the gregarious ruminants came down to the little streams, or by the shores of the lake to quench their thirst, they would be pounced upon by the flesh-loving hyænodon, drepanodon or dinichthys. It was probably near this place also that these animals would meet in fierce conflicts, the evidences of which remain to the present time in the cavities which the skulls reveal; one of these, of a huge cat, shows on either side the holes through the bony covering which had partially healed before the animal perished; and the cavities seem to correspond in form and position with the teeth of the largest hyænodon.

“The remains of those animals which, from their very nature, could not have existed in great numbers, are not abundant in the fossil state, while those of the ruminants occur in the

greatest abundance, and are widely diffused in the sediments, not only geographically, but vertically. The chances for the remains of a species seem to depend upon the number of individuals that existed. The remains of ruminants already obtained comprise at least nine-tenths of the entire collection, while of one species portions of at least seven hundred individuals have been discovered. There is another interesting feature in regard to these remarkable fossils, and that is the beauty and perfection of their preservation; the bones are so clean and white and the teeth so perfect, that when exposed upon the surface they present the appearance of having bleached only for a season. They could not have been transported from a great distance, neither could the waters have been swift and turbulent, for the bones seldom show any signs of having been water-worn, and the nice, sharp points and angles are as perfect as in life."

Minerals.—The mineral wealth of the State consists largely of the two coal beds which we have described—the true coal in the southeast, which possesses but little economic value, and the lignite, which will probably be found profitable. Peat exists in immense beds in Central and Western Nebraska, and in the opinion of Mr. E. A. Curley, a competent judge in these matters, in the best form and condition to be made available for fuel. At some time in the not distant future, these peat beds may prove more valuable than the thin seams of coal in the coal measures. Lime, sandstone, limestone, and marble for ornamental purposes, gypsum, and especially salt, are the other principal minerals. There are many salt basins in the central and western parts of the State. The most extensive is in Lancaster county, in a district of twelve by twenty-five miles, surrounding Lincoln, the capital of the State. The spring waters contain twenty-nine per cent. of salt, and the salt is manufactured by the solar evaporation process. The salt is said to be the purest in the world, having $98\frac{3}{10}$ per cent. of pure chloride of sodium. The sandstones, limestones, and marble or magnesian limestone, are all of excellent quality for building and ornamental purposes.

Soil and Vegetation.—The soil of the uplands is largely composed of loess, and that of the river valleys of alluvium. The two deposits are similar in chemical elements, and they form a very rich and durable soil, exceedingly valuable for agricultural purposes, ranging in thickness from five to one hundred and fifty and even two hundred feet. Careful analyses of the soil show that in the loess over eighty per cent. of the formation is finely comminuted silica: so fine that its true character can only be detected under a microscope. About ten per cent. of its substance is made up of carbonates and phosphates of lime. There are some small amounts of alkaline matter, iron and alumina; the result being a soil that can never be exhausted until every hill and valley which composes it is entirely worn away. Its finely comminuted silica gives it natural drainage in the highest degree. When torrents of rain come, the water soon percolates the soil, which, in its lowest depths, retains it like a huge sponge. When drouthy periods intervene, the moisture rises from below by capillary attraction, supplying nearly all the needs of vegetation in the dryest seasons. The richer surface soil overlies the sub-soil, and is from eighteen inches to three and four, and even six feet thick. It is organically the same as the sub-soil, but enriched with organic matter, the growth and decay of innumerable centuries—a garden soil, easily cultivated, and making the arable farm as a garden.

The prairie, clothed only by natural processes, presents its own testimony to the riches of the State. Its whole expanse is covered with grasses, there being not fewer than 150 species, and the most abundant, making the best pasture, showing green at the end of April, and affording feed until November. The blue joint grows everywhere except on low bottoms. Under ordinary conditions its growth is two and a half to four feet; and on cultivated grounds it is found from seven to ten feet high. Wild oats grow on the uplands, mixed with blue-joint. This grass is relished by cattle and is abundant. The buffalo grass, low in habit, is now found in the western half of the State. It disappears before cultivation, but it is nature's provision of food for grain-eating animals during winter, on the prairie, inasmuch as it retains its

nutriment all the year round. Among other feed grasses are several varieties of bunch-grass; and in the low lands a native blue-grass and the spangle-top, which latter makes excellent hay.

The Nebraska prairie is not bare of trees—in fact, the native trees furnish a large list. The river bluffs are clothed with them, and the banks of the streams. There are two kinds of buckeye, two of maple, the box-elder, two of locust, four of ash, four of elm, four of hickory, eleven of oak, twelve of willow (eight species being shrubs), three of birch, three of poplar, hackberry, iron wood, one sycamore, black walnut, two spruce firs, yellow pine, white cedar and red cedar. The shrubs include common juniper, linden, pawpaw, prickly ash, five sumacs, shrub trefoil, two species of red root, spindle-tree, buckthorn, six species of plum, six currants and gooseberries, five dogwoods, butter bush, buffalo berry, red and white mulberry, hazelnut and beaked hazelnut. Cedars are found on the islands of the Platte, and along the Loups and the Niobrara there is a goodly quantity of pine. But the point is here: this list of trees is proof that trees flourish on the prairie; and that as much timber as is needed for all uses can be raised on the farm.

During the Indian period, when prairie fires annually swept over the country, the timber was confined to the banks of the streams; but since the era of civilization and cultivation has commenced, the prairie fires are checked, and groves and forests have become possible on the prairie.

Zoölogy.—Buffaloes are entirely unknown even in the southwestern and northwestern parts of the State. The elk (*Cervus Canadensis*) is the noblest game animal of the plains; it sometimes weighs from 700 to 800 pounds, and its antlers are magnificent. Its range is in the west from the south to the north, feeding on the high prairies, and frequenting also the ravines. The antelope (*Antilocapra Americana*), in plentiful herds and fleet as the winds, is found everywhere west of Plum creek; and the white or long-tailed deer (*Cervus Leucurus*), and the black-tailed (*Cervus Macrotis*) are denizens of the same region—the white-tailed being found over the whole State. In the far west and among the ravines, the big-horn sheep (*Ovis Montana*) will now

and again fall to the rifle. The time for hunting is from the first of October to the end of December, the law protecting the animals during the remainder of the year. The jack rabbit or prairie hare (*Leporidae Campestris*) is common. He is a strong and fleet animal, and is good game for coursing, and only to be run down by the strongest and fleetest greyhounds. The little gray rabbit is also common, and affords excellent shooting; and away in the west, the sage rabbit. In the timber, the black bear and two species of lynx are found—rarely in the settled parts of the State, and more commonly on the frontier; and also in the same localities, the large white and gray wolf. The coyote, or prairie wolf, is also worth hunting, the animal having all the cunning of the fox and more than the wit of the prairie foxes, of which there are three species, the red fox, the prairie fox and the kit fox. Some of the streams are still populous with beavers, minks and muskrats. The game birds of Nebraska are plentiful; and in the season afford sport in abundance. The wild turkey is the noblest of them all. Civilization drives it away; but in the wilder parts of the State, the bird is common enough, and where the woods are thickening in the river counties, its reappearance is beginning to be noted. The prairie chickens—the grouse of the prairie—are everywhere; and away out on the frontier, the large sage hen. Quail are plentiful and readily shot; and there are several plovers which are worth the powder and shot of the sportsman. In early spring and late fall, large flocks of wild geese cross the State, resting during the journey on the rivers, creeks and ponds. Mallards, teal, and many other species of wild duck, are plentiful during the same seasons. Of cranes there are four or five species—the sand-hill crane, the largest, being accounted an excellent table-bird. There are numerous hawks, and the bald-headed eagle is frequently seen in the sparsely settled districts. The streams are well stocked with the common kinds of fish, and in the northwest there is an abundance of trout in the streams.

Historical Data.—Nebraska was originally a part of the great Louisiana Territory, and subsequently of Missouri Territory. As early as 1844, Senator Douglas introduced a bill for the establishment of a Nebraska Territory, which was to include Kansas, Dakota, Wyoming, and so much of Colorado and Montana as then belonged to us, but the bill failed. Ten years later (in 1854), Nebraska was organized as a Territory, including Dakota, Montana, most of Wyoming and Northeastern Colorado. In 1861 it was stripped of most of these, and in 1867 was admitted as a State with a population considerably under 100,000. On the completion of the Union Pacific Railroad, which had its eastern terminus at Omaha, its population began to increase, but its most rapid growth has been during the last five years.

CHAPTER XV.

NEVADA.

NEVADA, sometimes called the Silver State, is the central State of the seven lying west of the Rocky Mountains, and may be said in a general way to be bounded by Oregon and Idaho, Utah and Arizona, and California. Its shape is irregular, and can perhaps be best defined by the official statement of its boundary, made in the act of Congress settling its present boundary. This statement is as follows: "Commencing at the northwest corner of Utah Territory, and the southern line of Idaho, at the 37th degree of longitude west from Washington (and 114 degrees west from Greenwich), and in latitude forty-two degrees north, and running west along the southern line of Idaho and Oregon to longitude forty-three degrees west from Washington (and 120 degrees west from Greenwich); thence south, along the eastern line of California, to latitude thirty-nine degrees north, which falls in the southeastern part of Lake Tahoe; thence southeasterly to the intersection of the Colorado river, in latitude thirty-five degrees north, and opposite Fort Mojave; thence north and easterly up the centre of the Colorado river to the intersection of the thirty-seventh degree of longitude west from Washington (and

the 114th degree west from Greenwich), and the prolongation of the western line of Utah Territory; thence north, along the western line of Arizona and Utah, to the place of beginning; containing 71,737,741 acres, or 112,090 square miles."

The boundaries of the State have been changed once or twice, but the actual area above given is that of the United States Land Office, and that laid down in the act of Congress enlarging its boundaries. The area as given in the almanacs varies from 81,539 square miles (30,551 square miles below the fact) to 104,125 (7,965 square miles too small); but the actual area is that given above. The greatest length of the State from north to south is about 490 miles; its greatest breadth about 300 miles.

Topography and Surface.—Nevada is almost wholly within the limits of the great interior American Basin, which includes also nearly three-fifths of Utah. This basin is bounded on the east by the Wahsatch range, a continuation of the Bitter Root and Wind River Mountains of Idaho and Wyoming, extending to and along the northwestern bank of the Colorado river, and on the west by the Sierra Nevada. The two chains meet in Southeastern California, and are connected at the north by spurs running from east to west. Within the basin all streams are either lost in "sinks" or discharge their waters into fresh or salt water lakes within the basin. A small tract in Northern Nevada is outside of the basin, and is drained by the Owyhee river, an affluent of the Lewis fork or Snake river, one of the constituent streams of the Columbia river. In the extreme south two or three small tributaries of the Colorado, as the Virgin river, Muddy river and Las Vegas creek, have cut their way through the mountain barriers of the basin, and discharge their waters into the Colorado. The Humboldt, the Little Humboldt, the Reese, the Carson, the Amargosa and many smaller streams, either sink through the alkaline sands and disappear from sight, or fall into deep depressions apparently made by the giving way of the roof of some cavern, or fall into some one of the marshes or the numerous lakes, salt and fresh, which are found all over the State.

The area of the Great Basin is traversed from north to south by numerous parallel ranges of mountains, having an altitude of

about 9,000 feet. These are separated by fertile valleys, which are watered by streams flowing from the mountains and having their supply from the melting snows. These streams afford facilities for irrigation, without which, in most cases, the cultivation of the soil is impossible. But a very large part of the State consists of a lofty table-land, with mountain summits rising to an altitude of about 9,000 or 9,500 feet, and broken mainly by the deep ravines or cañons, caused by the erosion of mountain torrents. The long valleys between have an elevation of from 4,000 to 6,000 feet.

Lakes and Rivers.—The principal lakes are Tahoe, Pyramid, Walker, Carson, Washoe and Humboldt. Tahoe has an elevation above the sea-level of about 6,000 feet. It is about 1,500 feet in depth. It is situated in the Sierra Nevada Mountains, fourteen miles from Carson City. The western line of the State divides it about the centre. The water is very clear and cool, and remarkable for its specific lightness. The bodies of persons drowned in Lake Tahoe never rise to the surface. It is twenty-two miles in length by fourteen in width.

Pyramid lake is thirty-five miles long, and from ten to fifteen in width. Its elevation above sea-level is about 4,000 feet. It is situated in the southwestern portion of Humboldt county. It is surrounded by mountains, which rise to the height of about 3,000 feet. It has been sounded, and found in places 3,600 feet deep. It gets its name from a rock which rises 600 feet above the surface of the water in the shape of a pyramid. There is an island near the eastern side which contains about 600 acres of land, upon which rattlesnakes and wild goats abound. It has no outlet, and is fed by the Truckee river and other mountain streams.

Washoe lake is situated in Washoe county. Its waters are shallow and alkaline. It covers about six square miles. It is surrounded by mountains; on the west are the Sierras, from which it is chiefly fed by numerous small streams which flow out into the valley sink, and then rise again in the lake.

Walker lake is about twenty-five miles long and ten miles in width. Its area has been considerably increased of late years, so that the old stage road, formerly about five miles from its shores,

is now under water. It is situated in Mason valley, Esmeralda county. Its elevation above sea-level is about 4,000 feet, and its waters are fresh and clear.

Humboldt lake, more commonly called the Sink of Humboldt, is twenty miles in length and ten miles in width. Its waters are brackish and strongly impregnated with salt and soda. It is situated near the line between Humboldt and Churchill counties, and has an altitude above sea-level of 4,100 feet. It is about the lowest point in the Great Basin. The waters from the east and west meet here.

The Carson lakes are situated near the centre of Churchill county. They are about twenty miles apart, and spread out over a vast area of low ground, so that their dimensions vary greatly in proportion to the dryness of the season, and the amount of the snow-fall on the Sierras. In wet seasons they are connected by a slough with Humboldt lake; and the waters, like that of the latter lake, are impure, and contain a large per cent. of alkali and salt.

With the exception of the Colorado, none of the rivers of Nevada are navigable. The Colorado forms part of the southern boundary of the State. Its average width is one-half mile. The average current at ordinary low stages, where no contraction or special obstruction exists, is about three and one-half miles per hour. When it passes over rapids and through narrow cañons, the current is more than twice as rapid, so that it is difficult for steamboats to stem it.

The Truckee river forms an outlet for Lake Tahoe to empty its waters into Pyramid lake. Two-thirds of its entire course is in Washoe county. It affords many excellent sites for mills, but its waters are chiefly used in irrigating the fertile lands of Washoe county. During the past few years many ditches have been constructed for irrigating purposes, and still there is a large supply of water left.

The Carson river heads in the Sierra Nevada Mountains and flows through Douglas, Ormsby and Lyon counties. Although not so large as the Walker, its waters have been made much more useful. Numerous large quartz mills have been erected

on its banks, which are run by water-power. It irrigates thousands of acres of fertile lands, and also furnishes the means for the transportation of thousands of cords of wood from the mountains to the markets.

The Walker river also has its source in the Sierras; it flows through Esmeralda county, and empties its waters into Walker lake. It is only used for irrigation, being situated too far away from the mines to be made available for milling purposes.

The Humboldt river flows from the east. It has its source in Utah, and, after winding through a succession of mountains for a distance of about 300 miles, it empties its waters into Humboldt lake.

The Owyhee river has its source in the mountains which surround Independence valley. It flows north into the Snake and Columbia rivers, and finally empties its waters into the Pacific. It is the only river which rises within the borders of the State that has an outlet to the ocean. Reese river heads in the mountains to the southeast of Ione. It flows north, and sinks before reaching the Humboldt.

In all of these lakes and streams are found several varieties of food fish, chiefly different species of trout. In all of the mountain streams and in the head waters of the rivers already described brook trout abound, while in the lakes and those streams which empty into them are found silver trout. In Lake Tahoe a very large variety of trout is found, some of which have been caught which weighed thirty pounds each. In the Owyhee river are found salmon and salmon trout. Through the efforts of the Fish Commissioner appointed at the last session of the Legislature, Carson, Walker and Humboldt lakes and the Truckee river have been stocked with Schuylkill catfish and Sacramento perch. A fish hatchery has been established in Carson, and 200,000 McCloud river salmon are ready for distribution in the different lakes and streams in the State.

In the eastern counties considerable game is found, as prairie chickens, grouse and quail. In the mountains and upland valleys are often seen mountain sheep and antelope. The otter and beaver are sometimes found. The grizzly bear, cougar, wild cat,

lynx, wolf, cinnamon and black bears, coyotes, and generally the beasts of prey found in California, are also inhabitants of Nevada, though not as abundant as in some other States.

Climate.—The climate of Nevada, owing to the diversities of surface, variations of altitude and other causes, irrespective of the differences of latitude, varies greatly in different localities. The changes of the season are very irregular, and pass into each other without notice. Generally the extremes of temperature are not great. Within the Great Basin, during the summer months, the thermometer seldom rises above 95° Fahrenheit; nor does it often fall below zero in winter, except upon the mountains and in the most elevated and exposed valleys. At Carson City, where the elevation above sea-level is 4,630 feet, the annual mean temperature is about 52°, the annual maximum 68°, and the annual minimum 34°. At this point heavy winds from the southwest prevail. During the year 1876 there were 316 windy days, 217 cloudy, and 49 rainy. The fall of rain and snow for the same year was 17.73 inches. The nights are always cool in summer in all parts of the State. This marked peculiarity of climate is due to the cooling effects of the many ranges of snow-covered mountains. The atmosphere is exceedingly dry. There are never any fogs. The moisture of the clouds is condensed on the mountain-tops, so that the fall of rain in the valleys is very limited. The carcasses of dead animals dry up with but little offensive putrefaction, leaving the bones and hides mummified. In the eastern portion of the State cloud-bursts are of frequent occurrence from about the first of July to the middle of September. The climate is healthful. No country in the world is more free from infectious diseases. Epidemics are never known. Earthquake shocks are sometimes felt, but rarely severe enough to do any damage.

Geology and Mineralogy.—It has been demonstrated by the geological explorations on the fortieth parallel, that the Nevada ranges of mountains belong to the same system of upheavals which took place during the Jurassic period. These immense mountain masses are composed of sedimentary strata, granite and kindred formations and volcanic rocks. The stratified beds com-

prise the largest portion, and extend from the Azoic age up to the time of upheaval. The rock formations embrace nearly every species of sedimentary or eruptive products existing, from the earliest to the most recent period. In the mountains which skirt upon the Sierras, the eruptive rocks prevail; while farther east are found the metamorphic and sedimentary formations. Metaliferous deposits and veins exist in all the mountain ranges, the most productive of which still continues to be the Comstock lode.

The valleys, in general, correspond with the mountain ranges. They are sometimes short, being intersected by the low mountains, which in many places link together the parallel ranges, running north and south, but usually they are long and narrow. With but slight elevations, several openings are found, extending from the Humboldt river to the Colorado, the southern limit of the State. Many of the valleys are dry and unfit for cultivation; some are covered with alkali and sand, while others are scarcely less productive than the most fertile valleys of California. All have been mainly filled by the products of erosion.

Minerals.—Of the productions of Nevada, silver and gold are beyond comparison the most important. Scarcely twenty years have elapsed since this State was inhabited only by the red man, and a few Mormon settlers in Carson Valley; and yet during this time the enormous sum of \$400,000,000 in silver and gold have been produced from the Nevada mines. More than two-thirds of this yield has been since the year 1871.

Although silver and gold are the chief products of the State, there are other mineral resources which are of no mean importance. The lead product of Eastern Nevada has increased so rapidly during the past two years, that Eureka now stands at the head of the lead-producing districts in the United States. Tybo, too, is making rapid strides in the way of advancement. The product of these two districts falls but little short of that of Missouri, Iowa and Illinois combined.

The deposits of borax in Churchill and Esmeralda counties are sufficient to supply the demands of the world, but being situated so far away from the markets, the expense of transportation and the reduced price of the article have placed a limit upon its production. Fish lake, Columbus and Teal's Marsh have an almost

inexhaustible supply, and their thousands of acres must some day be profitable to the owners.

The salt deposits are beyond computation. In Humboldt, Churchill, Esmeralda, Lander, White Pine and Lincoln counties there are beds of salt covering thousands of acres and of unknown depths. The waters of North Soda lake, in Churchill county, 270 feet in depth, and covering an area of 400 acres, contain about thirty-three per cent. of soda. Sulphur is found in immense deposits in Humboldt county, and in a comparatively pure state. Antimony in paying quantities is found in a dozen districts, and mines rich in copper are being worked in Lander and White Pine counties. Cinnabar, occurring in brilliant red crystals, and also in amorphous masses, is found in Washoe and Nye counties. Gypsum, plumbago, manganese, cobalt, arsenic, magnesia, alum, nickel, nitre, iron of good quality, coal in small quantities, isinglass—such are some of the mineral products of Nevada, which will, in the future, produce some revenue to the people and State.

As was to be expected, the great falling off in the yield of the mines in the years 1879 and 1880 has raised the question whether they are approaching exhaustion, or whether there is to be a still more prosperous future for them. All past analogies in silver mining, both in Europe and America, forbid the idea of their exhaustion; the only real question is whether means can be devised to make the mining of low grade ores profitable when they are brought from a depth of 3,000 or 3,200 feet below the surface, where constant pumping of the very hot water from these great depths is required, and the temperature of the lower levels is 156° Fahrenheit, and the men can only work twenty minutes and rest twenty in four-hour shifts. If these lower levels yield silver ores assaying seventy-five to one hundred ounces to the ton, the working, even under these disadvantageous conditions, may be fairly profitable; but where the yield is only from fourteen to twenty-two ounces, as is too often the case, the margin is clearly too narrow to permit any considerable profit, and must in most cases result in an eventual loss.

On this question of the permanency of the mineral production from the mines now opened, the able and accomplished State Mineralogist, after a historical review of all the great silver mines of Europe and America, exhibiting their periods of decadence and revival, concludes his essay as follows:

“The history of all these European and American mines has been the same. They were discovered early; they have had their times of depression and times of extraordinary production; they have had their bonanzas and their barren levels; they have been abandoned at one time and energetically worked at another, but throughout all the ages they have continued to be productive to the present time, and without doubt will still continue to play an important part in the mining industries of the world in the future. One thousand years ago the Austrian miner descended the same shaft which the living descend to-day; for centuries to come, the huge piles of waste rock will grow higher and more rugged on the Saxon plains. Empires have risen and fallen; rulers have passed from history since the mines of Mexico and South America began to be worked; twenty centuries have not exhausted the mineral wealth of Spain. Reasoning from these facts, it is safe to conclude that the mines of Nevada are far from being worked out. When the character of our mines is compared with those of other countries, the product is found to be small, and considering the extent of territory as yet undeveloped, the amount of prospecting done has not been great. But when a larger population shall have permanently settled here; when men shall be satisfied with smaller gains, and capital shall be more interested in the work, then grander and more remunerative results may be expected than any which have yet been obtained. The new level opened by the Sutro Tunnel insures the working of the Comstock lode for an indefinite period in the future, and although the results have not thus far equalled expectations, yet there is sufficient encouragement to continued perseverance in this greatest enterprise of modern mining, and that perseverance cannot long fail to reap an ample reward.”

Mining Industry.—Twelve of the fourteen counties of Nevada have or have had mines of considerable importance. We will review them briefly in alphabetical order, showing the number of the mines and the product from them in 1877 and 1878, the latest detailed report we have been able to obtain :

Elko county had, in 1877, seven mines, and in addition an establishment where the tailings of the Leopard mine were worked over, yielding in that year \$24,799. The entire yield of these mines in 1877 was \$1,075,968.86. In 1878 but two mines of the seven were worked, but three new ones had been opened, and the yield for three-quarters of the year was \$941,918.94, indicating for the entire year a considerably larger yield from the five mines than from the whole seven the previous year, although four of the five had only been worked for six months.

The Sutro Tunnel, though its entrance is in Lyon county, was constructed to drain the mines on the Comstock lode. It is over four miles in length, and follows the ramifications of the principal mines, which it will drain to the depth of about 2,000 feet, and the deepest mines will only have to pump their surplus water from 1,000 to 1,200 feet to have it drawn off by this channel. The tunnel also contains railroad tracks to facilitate the removal of ores from the mines. Its cost was about \$6,000,000. The Tunnel Company own some mines on this lode. While its success has not thus far been so great as was hoped, it must eventually greatly enhance the value of the mining property connected with the Comstock lode.

Zoölogy.—The wild animals of Nevada are those of California, except those which find their homes in the sea or along the shores of the Pacific. The grizzly bear is the monarch of the forest, and the black and the Mexican bear are sufficiently numerous ; the cougar or panther, the wild cat, the gray wolf and the whole marten tribe, the lynx, skunk and raccoon are abundant. Of game animals, the elk, two species of deer, and possibly the moose, though that animal is very rare, Rocky Mountain sheep or big horn ; rabbits, squirrels, the sewellel, the gopher and other rodents are so numerous as to give annoyance. Birds of prey, song birds and game birds are plentiful. Reptiles are of the

same genera and species as in California. Trout and salmon trout are found in the larger lakes, but the smaller lakes are too alkaline for fish. Southern Nevada has few animals.

Agricultural Productions.—While Nevada is essentially a mining State, and contains but a comparatively small proportion of arable land, she can, by the aid of irrigation, raise a sufficient quantity of cereals, root crops, etc., to supply her small population, and by turning attention to stock-raising soon export many thousand head of cattle.

The soil of the State is generally a loam, most fertile where the underlying rock is limestone, but nearly everywhere sufficiently so to reward the labors of the husbandman, where water can be obtained for the purposes of irrigation. The immense stretches of barren wastes so often seen are only so because of the want of moistening showers of rain, and streams sufficiently numerous to supply the demands for agriculture. As a large proportion of the land is much better adapted to grazing than to tillage, much attention has been given to the raising of live-stock, and the horses, cattle, sheep and goats bred here are of excellent quality. The winter feed, consisting of bunch-grass and white sage, furnishes the best of sustenance for stock, so that, with rare exceptions, is any provision made or stores of fodder laid up for winter use. During the summer months the pasturage in the vicinity of springs, brooks and creeks on mountain sides and in the cañons supplies the feed, but when winter comes, the herds and flocks feed miles away from water in the valleys. The northern and eastern sections of the State are the best adapted for grazing. Many of the loftiest mountains are covered with a species of bunch-grass peculiar to those localities. The table-lands and dry valleys in many places are covered with the white sage, which makes the best of winter feed for stock. When growing in the spring and summer, this sage is bitter and not eaten, but when the frosts of fall and winter come it is tender, sweet and nutritious, and better liked by stock than other kinds of feed. So extensive has the business of stock-raising become that now the supply far exceeds the wants of the population, and thousands of steers and beef cattle are yearly shipped by railroad to the markets

of California. The agricultural lands of the State are small in proportion to the area, though in all of the valleys where are found streams of water large tracts of land are brought under cultivation, and the crops produced are very superior in character. The best of these arable lands are found in Carson, Eagle, Mason, Washoe, Truckee, Humboldt, Reese River, Owyhee, Lamoille, Ruby, Steptoe, Spring, White River, Snake, Panaca, Pahrnagat, Paradise, Muddy and Los Vegas Valleys. There are hundreds of other smaller valleys, and in many of them the soil is quite as productive, though less water is found; and there is no land in the State but what is benefited, for agriculture, by irrigation. In the northern and central valleys all the grains, vegetables, and fruits of a temperate climate are cultivated with success. In the southern valleys the proportion of fertile land is much less than in other sections of the State, except about springs and streams of water. The country is chiefly a desert. The scarcity of water is a noticeable feature, but where there is sufficient for irrigation, as in the Muddy and Las Vegas Valleys, the farmer is abundantly rewarded for his labor. Fruit trees, embracing nearly every variety known in both temperate and tropical climates, are cultivated. Growing here side by side are seen the olive and the plum, orange and apple, lemon and peach, fig and apricot, pomegranate and pear, and the walnut and pepper. Grapes also grow to perfection. The vineyards produce as perfectly ripened and delicious grapes as the most favored localities in California and France. Cotton and sorghum have been cultivated quite extensively; one acre of land yielding as much as a thousand pounds of the former. Melons, squashes and beans also grow abundantly, as well as corn and all the smaller grains. Some of the hardier vegetables, as potatoes, do not thrive so well. Two crops are raised yearly on the same land. It is first sown in small grains, as wheat, barley, rye and oats, which are harvested about the first of June. It is then planted in corn, beans, potatoes, beets, cabbage, onions, squashes, melons and all other varieties of garden vegetables. The mezquit bushes, which grow in some of these southern valleys, furnish a very nutritious bean, which all animals feed upon as soon as the grasses die in the fall.

Historical Data.—Nevada is a part of the region acquired from Mexico by the treaty of Guadalupe-Hidalgo in February, 1848. It was at first a part of California Territory, and on the admission of that State into the Union, was made a part of Utah Territory. It was set off as the Territory of Nevada, in March, 1861, but had not then so large an area as it has now. A part of its present boundaries on the east were fixed in 1862; it was admitted into the Union as a State in 1864, and received some further accessions of territory in 1866. It furnished its quota of soldiers to the civil war, and sent material aid to the Sanitary Commission to the extent of \$51,000.

Conclusion.—Nevada does not offer a very promising field for immigration. Its great mining operations are in the hands of wealthy capitalists, and are not at the present time very promising; there are probably new lodes and new placers which may prove very rich; but only capitalists will be able to hold or work them.

CHAPTER XVI.

NEW MEXICO.

NEW MEXICO is a central Territory of the southern tier of States and Territories of "Our Western Empire." It is a portion of the territory ceded by Mexico by the treaty of Guadalupe-Hidalgo, in February, 1848, and, previous to the cession, had been a State of that republic. It was created a Territory by Act of Congress, September 9th, 1850, but the Territorial government was not organized till March 1, 1851.

The Territory extends from 103° to 109° of west longitude from Greenwich, and from $31^{\circ} 20'$ to 37° north latitude. It is bounded by Colorado on the north, by Texas and the Indian Territory on the east, Texas and Old Mexico on the south, and Arizona on the west. It is almost a perfect square, a small tract projecting into Mexico, which was acquired by the Gadsden

treaty, in the southwest, being the only departure from completeness in its proportions. This tract contains some noted mineral springs, but otherwise is not at present known to be of much value. The greatest length of the Territory from north to south is 390 miles, and its greatest breadth from east to west 341 miles. Its area is 121,201 square miles, or 77,568,640 acres.

Mountain Chains.—The mountains enter the Territory from Colorado in two ranges, the eastern, lying wholly east of the Rio Grande, being a continuation of the Sangre de Cristo, or Park range, of Colorado, and continuing below the 37th parallel under the name of the Raton Mountains. The whole range is high, and numerous elevated summits and lofty peaks, as well as continuous ridges of great height, are found in its course; but these terminate abruptly a short distance below Santa Fé, and only an elevated and somewhat broken plateau remains of this range from that point to the Texan boundary. The other range, which seems to be a continuation of the San Juan and Uncompahgre Mountains of Colorado, consists of many detached mountains of lower altitude, with passes between them of only 5,000 or 6,000 feet in height. They are known in New Mexico as the Sierra Madre, and form the connecting link between the lofty and rugged mountains of Western Colorado and the equally lofty Sierra Madre of the Republic of Mexico. The various groups of these detached mountains with the valleys between them fill up almost the entire region west of the Rio Grande. Though the eastern mountains are much the highest, yet here, as in Southern Colorado, the western and lower mountains form the water-shed between the waters flowing to the Atlantic and Pacific Oceans. There are a chain of hills of moderate elevation along the eastern bank of the Rio Pecos, which form the boundary on the west side of the vast Llano Estacado, or Staked Plain.

Topography.—The face of the country is diversified by mountains, valleys, plains, and high level plateaux or mesas; similarity of climate, character and resources, pertaining to a large portion of the country, excepting in the highest ranges and lowest valleys. In portions of the Territory the surface is much broken and disrupted by chains of mountains, preserving a general direction of

north and south. Intervening, there are large areas of table lands, bisected by many large and small valleys of unsurpassed fertility, and susceptible of the highest state of cultivation. The valleys have a mean altitude above the sea of 4,500 feet, and the mountains on either side of the Rio Grande del Norte and Rio Pecos of 6,000 to 8,000 feet. In the more northerly portions of the Territory they rise to 10,000 and 12,000 feet.

Rivers and Lakes.—The rivers of New Mexico contribute to both the Atlantic and Pacific slopes. The eastern is watered and drained by the Canadian and its tributaries into the Mississippi, and the Rio Grande del Norte and its tributaries into the Gulf of Mexico. The western slope is watered and drained by the Colorado of the West and Rio Gila, and their tributaries, into the Gulf of California. The Rio Grande del Norte takes its rise in the high mountains, north of the boundary line of New Mexico, where it is fed by numerous springs and the meltings of the annual snows, and augmented by tributaries, watering and draining a vast area of some of the finest farming and grazing lands on the continent. It flows south through the western division of the Territory, a broad, beautiful river, enriching with its turbid water a valley more than 400 miles long and many miles in breadth—one of the most wonderful for fertility and beauty in the world. The Rio Pecos, on the eastern slope of the principal mountains, has its source in the mountains near Santa Fé, watering and draining, through its numerous tributaries, an immense district of country, and flowing through its eastern division into Texas, through a valley only second in importance to that of the Rio Grande del Norte, with which it forms a junction below the southern boundary. The Canadian river flows to the east, and through its affluents waters and drains the entire northeastern part of the country. The Rio San Juan, formed by the Rio Piedra, Rio Los Pinos, Rio Florida, Rio de Los Animas, Rio Navajo, Rio de La Plata and other smaller streams, constitutes one of the most beautiful rivers in the West, watering and draining all the southwestern slope of the San Juan Mountains. In the southwest the Rio Mimbres, Agate creek, Bear creek, and the San Francisco river, together with the head waters of the Rio Gila, water and drain the region.

East of these, and flowing from either side of a system of detached mountains, occupying nearly the longitudinal centre of the Territory, and extending through its entire length from north to south, terminating in the Guadalupe Mountains on the borders of Texas, are a large number of small rivers and creeks, supplying a large area of table lands and valleys, as well as a portion of the Terraces of the Rio Grande and Rio Pecos with pure living water. Besides these, almost every mountain and hill is supplied with numerous springs of sparkling cold water; also, there are many good springs found in the low depressions and valleys many miles distant from the mountains. Thus, it will be seen that the water supply is far more ample than the casual observer or stranger would infer from an examination of maps drafted years ago, or a supposition derived from vague reports of the arid climate and light rainfalls.

Climate.—There is great diversity of climate, owing to differences in latitude and altitude between different portions of the country. Almost any degree of temperature may be attained by change of locality, there being a wide range of extremes in temperature. In the lower plateaux, the summer days are warm, but not debilitating, because the atmosphere is so dry that perspiration is rapidly absorbed. The nights are always cool and bracing. The climate throughout the Territory is so mild and equable, combining dryness and purity, particularly so on the plateaux of mean elevation, that many persons afflicted with pulmonary and other diseases of a like character, have tested its salubrity with marked benefit, and in many cases permanent cure. Those who have lived in this delightful climate for a few years believe it to be the healthiest location in the United States.

Mr. Zimri L. White, the able correspondent of the *New York Tribune*, writing from the Territory in September, 1880, says:

“The summer climate of the northern part of the Territory is delightful. At Santa Fé, which has an altitude of about 7,000 feet, the nights are always so cool that heavy blankets upon the beds are comfortable, and the heat at midday, although sometimes great, is never oppressive. Americans here dress in heavy woollen fabrics, both for outside and underwear, at all seasons

of the year. I am told that the winters are mild and sunny, with comparatively little snow. The low altitudes in the central and southern portions of the Territory are very hot and dry, but on account of the absence of moisture in the atmosphere and the exceedingly rapid evaporation, the apparent intensity of the heat is much reduced. The temperature in the mountains is always and everywhere delightful.

New Mexico as a Health Resort.—New Mexico has a deservedly high reputation as a sanitary resort in pulmonary diseases, and that its real character and the diseases which are benefited by a residence there may be better understood, we present the following testimony from eminent physicians and others long resident in the Territory.

Lewis Kennan, M. D., an eminent physician of Silver City, New Mexico, twenty-seven years resident in the Territory, says: "It is certain that even when the lungs were irreparably diseased, very much benefit has resulted. Invalids have come here with the system falling into tubercular ruin, and their lives have been astonishingly prolonged by the dry, bracing atmosphere. The most amazing results, however, are produced in warding off the approaches of phthisis, and I am sure there are but few cases which, if sent here before the malady is well advanced, would fail to be arrested. Where hardening has occurred or even considerable cavities have been detected in the lungs, relief altogether surprising has taken place. The lowest death rate from tubercular disease in America is found in New Mexico, notwithstanding the large number of cases of that disease who resort thither for healing. The census of 1870 gives twenty-five per cent. as the death rate from this disease in New England, fourteen in Minnesota, from five to six in the different Southern States, and three per cent. in New Mexico. I have never known a case of bronchitis or asthma in the Territory that was not greatly improved or altogether cured. For rheumatism and diseases of the heart with or without a rheumatic origin, I would not recommend this climate. Valvular difficulty in that organ is invariably made worse."

Geology and Mineralogy.—The surface rocks of the great plateau, which comprises so large a portion of the Territory, belong to the cretaceous period, except those in the southwest and west, which are a part of the plateau of the Sierra Madre, and are entirely of the eozoic period. The summits of the Rocky Mountain system, as well as those of the Sierra Madre, are also eozoic, but the peaks are capped with metamorphic rocks, chiefly porphyry, trap and basalt. Besides these exceptions, there are three considerable tracts which are volcanic, and covered with lava, which is, apparently, only a few centuries old; the first of these tracts is in the Zuni Mountains, between the Rio Puerco and the Rio San José, including Mount Taylor; the second is east of and parallel to the Rio Grande; it is nearly 140 miles in length; the third is near the northern boundary of the Territory, along the west bank of the Rio Grande and extending to the Rio Chama. The tract east of the Rio Grande is called *Mal Pais* ("bad country"), and besides the lava, has a broad expanse of volcanic sand, alternating with salt marshes.

The valleys of the Rio Pecos and of the Canadian river and its branches are triassic or jurassic, and at some points are underlaid with coal at such depths as to be accessible. The valley of the Rio Grande above the thirty-fifth parallel is tertiary: below that parallel it partakes of the general character of the plateau, and is cretaceous. The foot-hills of the eastern slope of the Guadalupe Mountains are triassic. There are two considerable tracts of tertiary in the northeastern portion of the Territory, the larger of the two lying between the head-waters of the Cimmaron and the north fork of the Canadian rivers, and the smaller between two of the affluents of the Canadian.

Mineral Wealth.—The geological formations of New Mexico form an extremely interesting study, as well on account of their peculiarities as of the vast quantities of minerals, especially the precious metals, which are contained in some of them. The syenitic rocks of the mountains which traverse the central plateau between the Pecos and the Rio Grande, and the carboniferous limestones found on the flanks and sometimes on the ridges of these mountains, are both traversed by mineral-bearing lodes.

In the sandstone formation beds of lignite and bituminous coal from three to five feet in thickness are found, alternating with layers of iron ore of good quality and fire-clay. In the Old Placer Mountains and elsewhere, mines of anthracite of a superior quality have been opened. Marls, gypsum, and other valuable earths are abundant and easy of access, but little has been done to develop the deposits. Zinc, manganese, quicksilver and some minor minerals occur. In the Placer mountains, and at several other points, especially near Pinos Altos and Embudo, iron is worked. Lead is found in the Pinos Altos mines, in the Organ mountains, and at other points. Copper is even more abundant, and some of the mines yield large results. The chief deposits worked are those of the Manzano, Magollon, and Magdalena mountains.

Turquoise of rare beauty has been found in the Cerillos Mountains, about twenty miles southwest of Santa Fé, and mines of it were worked with great profit before the Indian revolt in 1680. The finest turquoise in Europe, one of the jewels of the Spanish crown, was obtained in these mountains more than two centuries ago.

Hot springs and other mineral springs of great medicinal virtue, abound in New Mexico. Governor Wallace says that excellent hot springs have been discovered at Fernandez, in Taos county; at Las Vegas, San Miguel county; at Ojo Caliente, in Rio Arriba county; near Jemez, in Bernalillo county; near Fort McRae, Socorro county; Fort Selden, Doña Ana county; and at Mimbres, in Grant county. Those at Jemez are probably unexcelled in the world. At Las Vegas elaborate preparations are in progress for the care and entertainment of guests and invalids. Any and all these springs are equal in curative qualities, if not superior, to those in Arkansas. They have certainly the attraction of an unsurpassed climate.

In this connection mention may be made of the soda springs, of which there are several. One, east of Isleta eighteen or twenty miles, is particularly worthy of notice as yielding seltzer quite equal to the best imported article.

But the chief mineral wealth of this rich Territory is contained

in its gold and silver mines, some of which have been worked since remote times. The earliest Spanish discoverers found such convincing proofs of the richness of the gold and silver deposits that they gave to the country its present name from the resemblance to the mineral regions of old Mexico. Throughout the periods of the Spanish and Mexican occupancy the precious metals were worked, and even with the rude appliances and desultory methods of those peoples, wonderful results were obtained. Capital, abundant water power and railroad communication, are the three desiderata for the successful development of the rich mines of this country, which are believed to rival the most productive deposits known. The chief gold fields now operated are those of Colfax, Grant, Santa Fé and Bernalillo counties, and of the Carrizo, Sierra Blanca, Patos, Jicarilla and Magdalena Mountains, but these are only a few of the many regions in which gold is known to exist. So far little more than the placers have been touched, while the great resources of the quartz lodes still await the advent of machinery, capital, and, above all, well-directed labor. The silver mines of Pinos Altos, the Cerillos, Sandia and Magdalena Mountains, formerly so productive, have been worked in a perfunctory way, but without any organized system of procedure, and the production is now small. A few words should be said in regard to the coal deposits of New Mexico. The greater part of the coal deposits throughout "Our Western Empire" are bituminous, and even where they are called anthracites, they are generally only a little harder or denser veins of the bituminous coal, and at most can be regarded as only semi-anthracites. Some geologists have boldly declared that there was *no* anthracite west of the Mississippi river, and have predicted that nothing of the kind would ever be discovered there; but they are certainly in error. Whether the so-called anthracites of Southwestern Colorado, of Texas, of Arizona and of Utah, will prove to be true anthracites, may be a question until we have more and more careful and thorough analyses of them; but that there is anthracite coal in Northwest Washington Territory, and that it is abundant in New Mexico, seems to be proved beyond the possibility of a doubt. The only locality where it has thus far been found is

among the foot-hills of the Placer Mountains, about thirty miles south-southwest of Santa Fé. The formation is tertiary, but it has been subjected at various times to volcanic action, as the lava and metamorphic rocks plainly indicate. Mr. Z. L. White examined these coal deposits very carefully in August, 1880, and though previously faithless in regard to the existence of anthracite anywhere in this region, became fully satisfied that it was anthracite, and of the very best quality. The mines already opened are on the "Ortiz Grant," and the coals in this, of which there are twenty-seven veins, ranging from a few inches to more than six feet in thickness, are easily accessible. The coal was probably originally a lignite of excellent quality of the tertiary, but by volcanic action was changed into anthracite. Mr. White fortifies his opinion by the definition of true anthracite given in the best treatises on coal, and by three analyses made by the geologists of Lieutenant Wheeler's expedition in 1875, by R. D. Owen and E. T. Cox in 1865, and by Professor J. L. Leconte in 1868, and in a fourth column gives the analysis of the Pennsylvania anthracites from "Dana's Mineralogy." The economic importance of this anthracite coal to the whole West, it being very near the Atchison, Topeka and Santa Fé Railroad, must be our apology for devoting so much space to it.

Constituents.	ANALYSES.			
	W.	O. & C.	Lec.	Penna. Coal.
Water	2.10	3.50	2.90	
Gas	6.63	4.50	3.18	3.84
Fixed Carbon	86.22	87.00	88.91	87.45
Ash	5.05	5.00	5.21	7.37
Totals	100.00	100.00	100.00	98.66

"True anthracite has a specific gravity of 1.4 to 1.7; its hardness is 2 to 2.5; and it contains 85 to 93 per cent. of fixed carbon; and volatile matter, after drying, 3 to 6 per cent. It is amorphous, of conchoidal fracture, brittle, has a sub-metallic lustre, iron black to grayish and brownish black color, and when pulverized forms a black powder. It ignites with difficulty and at a high temperature, but when ignited produces an intense heat. This is an exact description of the coal in the Ortiz mines."

Agricultural Productions.—There are in New Mexico from 18,000,000 to 20,000,000 acres of arable lands, or at least that much can be brought under successful cultivation, when a judicious system of irrigating canals and reservoirs shall have been constructed. More than three-fourths of all the waters of the Territory run to waste at present. The country is admirably supplied with hundreds of natural basins on the elevated plateaux, where the water of all or nearly all the streams could be stored by means of canals and ditches. The water supplies would commence accumulating during the early fall, and continue through the winter, spring and early summer rises or freshets, from the melting snow in the high mountains. In this way immense reservoirs could be accumulated, ample for all purposes.

The soil of the valleys throughout the Territory is a rich sandy loam, composed of the disintegrated matter of the older rocks and volcanic ashes. It is light and porous and of surprising fertility. Corn, wheat, oats and barley grow well in all parts of the Territory; corn is a staple product. The cereals do best in the northern districts and elevated plateaux; corn, vegetables and all kinds of fruit do best in the valleys; corn, in the rich bottoms, along the principal streams, if well cultivated, may be made to yield over eighty bushels per acre; wheat on the uplands often yields over fifty bushels per acre, and in portions of the Rio Grande Valley averages twenty-five bushels under the rudest and most imperfect culture.* Farm lands in the Taos Valley and

* Mr. White says of the native agriculture :

“The Mexican and Indian methods of harvesting their grain are very primitive, similar, indeed, to those of Eastern countries in Bible times. The wheat is cut by hand with a sickle, and taken, unbound, in carts to the threshing-floor. This consists of a round plat of level ground in an elevated place, fifty, one hundred, or two hundred feet in diameter, as the farm is a large or small one, the surface of which is pounded or trodden as hard as a cement floor. Around the edges of this, tall poles are set in the ground five or six feet apart, forming a circle. The unthreshed grain is piled up loosely in the centre, and, when everything is ready, a thin layer is raked down between the central pile of grain and the circle of poles, and then a flock of goats or sheep, or sometimes of burros, or ponies, is driven around over the grain until it has all been beaten out of the heads by their feet. The straw is then thrown outside of the circle of poles, and the wheat pushed up toward the centre. Another lot of the unthreshed grain is then raked down, and the operation repeated until the whole is threshed. I was forcibly reminded of the Scriptural injunction which forbade the Hebrews to muzzle the ox that trod out the grain. The winnowing is also done in the Biblical way. After the wheat has been separated from the straw, it is gathered up into a heap, and when a brisk breeze arises it is thrown into the air in

in the vicinity of Santa Fé have been under cultivation over 200 years, and in all that time not one ounce of fertilizing material has been used to enrich them; yet there is no perceptible diminution in crops. The valley of the Rio Grande del Norte, for 400 miles in length, averaging five miles in breadth, can all be irrigated with the turbid water of the stream from which its name is derived. This stream, like the Nile, is the sole reliance of the farmer; the water is turbid with sediment, one-fifth of its weight at high water. At such times, each irrigation is equal, if not superior, to a coat of the richest fertilizer. El-Paso Valley has been cultivated in this way over 265 years.

The valley of the Rio Grande del Norte is admirably adapted to grape culture: there is probably no part of the *world* where all the conditions of soil, humidity and temperature are united to produce this delicious fruit in greater perfection. The frosts of winter are just severe enough to destroy insects without injuring the vines, and the rains seldom fall at the season when the plant is flowering, or when the fruit is coming into maturity, and liable to rot from exposure to moisture; as a result, the fruit, when ripe, has a thin skin, scarcely any pulp, and is devoid of the musky taste usual with American grapes. Grapes do well also on the lower valley of the Pecos, and in many other parts of the Territory.

Mr. White says of the grape culture: "Grapes constitute one of the principal crops of the Rio Grande Valley. The commonest variety is the Muscat, from which a very good wine is made. The vineyards look like plantations of currant bushes, the vines

the teeth of the wind, which blows away the chaff while the wheat falls by itself on the clean floor. At a distance the flying chaff looks like steam escaping by successive puffs from the exhaust pipe of an engine.

"The Mexicans and some of the Indians are beginning to adopt modern farming implements, and in a few years iron ploughs will probably have replaced the wooden ones that have been in use here for centuries, and which are exactly like those with which the Egyptians cultivated the valley of the Nile in the time of Moses. I saw one of these ploughs, but as this is not the season when the ground is broken up, I have had no opportunity to observe its use. It consisted simply of a crooked stick, upon the point of which an iron point was fastened by means of raw-hide thongs. The Pueblo Indian carts are also curiosities. Not a scrap of iron is used in their manufacture. The wheels are discs made of boards, with a clumsy wooden hub on the outside. The tire is of raw-hide, and the body of the cart is constructed of poles rudely framed together"

being planted in rectangular order, and trained in the form of shrubs. The fruit is delicious, like that of California, and I have no doubt that the wine crop of the valley will, before many years, become one of the largest and most profitable in the Territory. Archbishop Lamy, who is a native of France, and who, during the almost third of a century of his residence here, has travelled thousands of miles every year among the Mexican and Indian population of New Mexico, told me that no part of California is better adapted for the culture of grapes and the manufacture of wine than the Rio Grande Valley. The natives tread out the juice of the grapes with their feet, as did the slaves in the great vineyards of classic times.

"The orchards of the valley are remarkably thrifty and prolific, and the fruit is large and fair. I never saw apple trees that were apparently so free from disease. The bark was as bright as though the trunks of the trees had been washed in lye. The peach and plum trees are large and full of fruit. The orchards do not appear to have been planted with much regularity, but the trees seem to have been stuck down by the side of the acequias, wherever they were certain to have plenty of water."

Cabbages grow finely, often weighing from thirty to sixty pounds each. Onions also grow very large, weighing from one to two pounds each; those raised in the Raton Mountains are said to possess the finest flavor. Irish potatoes are grown in the northern districts, where they yield enormously. Sweet potatoes are raised in the Mesilla Valley, and at Fort Stanton, on the Rio Bonito and Ruidoso, in Lincoln county.

Beets, radishes, turnips, parsnips and carrots grow well everywhere. Beans, peas and tobacco are also grown successfully; beans to the native population are what the potato is to the Irish. Apples do well in almost all parts of the country. Peaches, pears and apricots do well from Bernalillo down; also on the Pecos from Anton Chico down; melons of all kinds grow to large proportions, and of the most delicious flavor.

Not more than one-tenth of the valleys of the Rio Grande or Pecos are occupied or cultivated. The same may be said of an hundred other valleys and terraces along the large streams, and

especially so of the higher plateaux. The most extensive settlements are confined to the valleys of the principal streams. Those of the Rio Grande, Pecos, and Mora contain the majority, the balance being located in the small valleys and isolated districts, in and near the mountains, where their pursuits are divided between agriculture and stock-raising.

The only forage crop of the grasses that has been attempted here is "Alfalfa," the Chilian or California clover; when cultivated it yields an enormous crop. It grows well throughout the Territory, and in the southern districts often yields three crops per annum. In a country where there is such a profusion of nutritious grasses, as are indigenous to the mesas and mountain slopes, it is not necessary to cultivate forage crops, except for the sustenance of farm animals, and those in use in the towns. Thousands of tons of grama grass are cut annually to supply the demands of military posts and stage stations.

As a sample of what can be done in the valley of the Rio Grande, it is only necessary to refer to the beautiful Mesilla Valley; it is seventy miles long, and embraces 280 square miles, or 179,200 acres, or 560 farms of 320 acres each. It is one of the richest and most delightful valleys in the world. There are farmers who settled in this valley only fifteen years ago, without one dollar to start with, who to-day are worth from \$50,000 to \$60,000, and every dollar of it made from the products of the soil. It is the rival of any portion of California in the raising of all kinds of fruit, and as to grapes it is not surpassed by any district in the world. In the coldest season the thermometer never falls lower than 15° above zero. Snow is scarcely ever seen. It is a district that needs only to be seen to be appreciated.

The most valuable timber in New Mexico is the pine,—its growth principally confined to the mountain districts and high rolling lands. Pitch, yellow and spruce varieties grow to a large size, and make excellent lumber. Cottonwood, walnut, locust, box-alder and sugar tree fringe the streams and cañons of the mountains. Also live oak of small size, and a peculiar species

of cedar, called here "juniper." It grows on the upland, and to large size, throughout the southern half of the Territory. The nut-pine, or piñon, is abundant, and makes good charcoal and fire-wood. The timber supply is ample for all purposes.

Stock-Raising.—Though not as arid as Arizona, good water, even in the mountains, is very scarce. On the plains and mesas and in the valleys, running water is seldom seen, and when it is found, it is so strongly charged with alkali as not to be drinkable. It is not an uncommon thing to travel thirty or forty miles without seeing a spring or a drop of water in the river courses. Cattle, horses and sheep on the ranges often habitually go two or three days without water. About twice a week they get around to some spot where the bed-rock of a stream rises to the surface bringing the water with it, remain in the vicinity overnight, and then wander off perhaps twenty-five miles, returning again about the third day.

Cattle and sheep-raising is carried on very successfully over large areas in New Mexico, and although the grama grass is so thin that it will not support as many animals to a thousand acres as the bunch grass of the more northern Territories, it furnishes a wonderfully nutritious food, and the country is by no means fully stocked. There is great room for improvement in the grade of all kinds of stock, but even now the business of grazing is a remarkably profitable one. The markets of Kansas and Colorado are easily accessible to New Mexican stock-men, and this has given a great impetus to the business.

While there are considerable tracts in which cattle will do well, and the raising of bees for the market may yet become a very profitable industry in New Mexico, yet for the present and probably for many years to come it will be pre-eminently the country for sheep-farming. The number of sheep in the Territory is probably not less than two millions, of which half a million or more are owned by the Navajoes, an Indian tribe occupying its western and northwestern portions.

The Hon. J. Francisco Chaves, once a delegate in Congress from New Mexico, in a letter to General Brisbin the author of "The Beef Bonanza," says of sheep-farming in New Mexico ;

“Without having the data before me, and only judging from what I know of the Territory and of the large sheep-owners in it, I am satisfied that I do not overestimate the number in stating them at 1,500,000 head of ewes. The climate is exceedingly temperate and salubrious; no diseases, much less those affecting the skin or hoofs, being known. Sheep in our Territory are herded and grazed from one portion of the Territory to another during the same year, thus adopting what may be termed the migratory plan. The climate is dry and the soil is gravelly, producing the most nutritious grasses and shrubs. Of the former the grama and bunch grass, of which there are two or three different varieties, and the latter the various kinds of sage, which make the best and most nutritious of browsing, and a large amount of underbrush and seed grass in the mountains. Were it not for the insecurity of life and property caused by the wild, marauding tribes of Indians, especially the Navajoes, but a few years would elapse before New Mexico's hills and plains would be literally covered with fleecy flocks. It is but a few years back, and actually within my own personal recollection, when nearly 1,000,000 sheep were actually driven to market to southern Mexico from our Territory. At that time sheep were worth but twenty-five cents per head, and all those engaged in the business made money. That prosperity in the history of New Mexico was superinduced by twelve years of unintermitted peace with the Navajoes. A sheep-raiser in New Mexico can safely calculate on an increase of eighty per cent. at least. A sheep-raiser in New Mexico, notwithstanding the coarse quality of wool of the present flock, can herd his sheep and make a profit from the product of his wool, and have all the increase of his stock in addition thereto. I have no hesitation in saying that New Mexico can fairly compete with Australia, South Africa and South America, in the production of cheap wool. These statements may appear to you somewhat exaggerated, but I assure you, on the contrary, that they are within the limits of reasonable bounds. I was born and raised in New Mexico, my friends and relations have always owned sheep, and I myself have to a large extent been an owner of that kind of property, and therefore speak from personal experience.”

The gold districts are: The Moreno mines, on Ute creek, Colfax county. One mine proprietor carries water to his claims near Elizabethtown, by ditch and flumes forty-two miles. At Pinos Altos extensive work (quartz mining) is going on with good returns. In this district, gold, silver, copper, zinc, lead and plumbago are all obtainable.

Objects of Interest in the Territory.—These are of various kinds, archæological, ethnological, fossil, volcanic, and the results of glacial and erosive action of water. All that portion of New Mexico lying west of the Rocky Mountains belongs to the great valley between the Rocky Mountains and the Sierra Nevada, which extends from Idaho and the eastern part of Oregon and Washington Territory through Utah and Nevada, Western Colorado, Western New Mexico and Arizona into Mexico, and terminates along the eastern shore of the Gulf of California. It is a land of lofty *mesas*, deep and rugged cañons, precipitous mountains, and hot, dry plateaux; a land of frequent drought, and of terrible volcanic action in the past, and perhaps the not distant past. There are deep valleys, where no water capable of sustaining life is to be had, but where alkaline and sulphurous vapors rise continually, and lofty, perpendicular walls of porphyry and trachyte forbid escape, yet to remain there for any considerable time is certain death. Of such as these are the Death Valley, in Southeastern California, the *Jornada del Muerto* of New Mexico, and the *Mal Pais* of the same Territory; while evidences of the destruction of former inhabitants by sudden volcanic eruptions, more fatal and extensive than that of Herculaneum and Pompeii, is not wanting. One of the most remarkable of these overwhelmed cities is that of Abo, in the Manzanita Mountains, about a hundred miles south of Santa Fé, in Valencia county, eighteen miles east of the Atchison, Topeka and Santa Fé Railway, and perhaps twenty miles from the Rio Grande. It was discovered by Messrs. H. J. Patterson and J. H. Mackley during the summer of 1880. Messrs. Patterson and Mackley are citizens of St. Louis, who had been exploring New Mexico for mining properties for some months. The following are the principal points in their narrative:

Manzana Mountains mean Apple Mountains. There is a noble spring of water called the Abo spring, which is shaded by two immense cottonwood trees on each side. There are no inhabitants in the vicinity, but everywhere there are evidences of the former existence of a dense population. There are seen the ruins of a large church or temple, covering one acre of ground. Mr. Patterson paced it off, and found it to be seventy paces square. The walls that remain are sixty feet high. The roof has long since caved in, and the interior of the enclosure is filled with *debris*. The thickness of the wall at the base is about ten feet. Mr. Patterson brought away a piece of one of the timbers that protruded from the walls. It is of what is called in that country the piñon tree, a species of pine, and is as sound as when taken from the tree. There are on one side of the piece of timber some rude figures, one of the All-Seeing eye, representing probably the sun. Other figures are deeply indented in the wood, as if made by anything but a sharp-edged tool. Mr. Patterson says that he found stone hammers, but nothing in the shape of sharp-edged or steel tools. There are small furrows seen in the wood, as if plowed out with a stone gouge. The building evidently belonged to a style of architecture anterior to the adobe and dried brick period. Mr. Patterson inclines to the opinion that the locality was the site of one of the seven cities of Cibola, mentioned by the Spanish chroniclers, the author of which traversed the country after the conquest of Mexico, among which were the cities of Camelone, Grand Cavra, Santa Cruz, Puerto de Abo, the Abo and the old Pecos, and another situated a few miles west of Abo in the lava beds. Mr. Patterson asserts that the old city in question was never until quite recently explored by white men.

Another specimen brought by these gentlemen is a human skull, evidently that of a young female, as shown by the teeth, which was exhumed about half a mile from the church. Skulls are quite plentiful among the old ruins in the vicinity. About five miles from the Abo Springs they have discovered some ancient silver diggings. They were brought to light in this wise: some three months ago a gentleman named Livingston, who was engaged in mining operations at the White Oaks, lost

some stock and went in search of it in the neighborhood of the Manzanita Mountains. While here a Mexican handed him a piece of ore for examination, which he stated he had found in the hills of the vicinity, but the exact locality he declined to indicate. Mr. Livingston, on his return to White Oaks, showed the specimen to some friends in camp, among whom were Messrs. Patterson and Davidson. They left White Oaks with a complete outfit to explore the Manzanita range, and were amply rewarded in the discoveries made. Right below the old mines they found twenty-two old smelters, and there were acres covered with the slag, some specimens of which Mr. Patterson brings with him. The smelters were built of adobe, or sun-dried bricks, and were elevated some twenty or thirty feet above the surface of the ground.

In digging down they found the remains of charcoal, which was used for fuel by the old smelters. There were also seen the remains of an aqueduct, in which water was conveyed from a spring three-fourths of a mile distant to a dam which diverted the water into the smelting works.

About five acres were found covered with slag, which Mr. Patterson has taken up for a mill site. From the old furnaces a trail was found, after considerable exploration, leading directly from the smelting works to the mine in the mountains, which here rise in peaks to a height of 10,000 feet. The ancient trail pursues a zigzag course, having a length of some five miles, while, in an air line, the distance is not much exceeding one mile. Everything was transported in those old mining days on men's shoulders to and from the mountains. There are now trees of the "pinon" growing on the trail larger than a man's body, showing the antiquity of the path. Mr. Patterson said he was two weeks in discovering the mines after finding the smelting works. The trail was five feet wide and protected by rocks on one side near precipitous places. Limbs were seen some thirty feet high on trees that had been cut when the trees were small and the limbs near the ground. The cutting was haggled, and evidently not made with sharp tools.

The mines were found filled with old timber. The explorers

could not imagine for what purpose the timber was used, because the walls of the mine are quartzite, and, therefore, it was unnecessary to protect the sides from tumbling in by timber supports. They, therefore, made up their minds that the mine was covered up with timber to conceal it. The timber had rotted and fallen in from the top, choking up the passage. Thirteen of the party worked nearly two weeks in clearing out the mine, removing the timber, stagnant water and old leaves. They found the mine seventy feet deep, with several horizontal drifts from the main shaft. The rock is found to be very rich, as appears from the specimens brought here.

An old miner named Baxter found, in digging down, a chamber about ten feet square, having on one side a fireplace, across which hung a crane having a clay hook, and at the end of the hook was a bone. On the opposite side of the fireplace was found the skeleton of a man in a sitting position, who was evidently watching the bone roasting for his meal, when he and his habitation were overwhelmed in ruin by a sudden discharge of lava from the mountain. There are lava beds near there extending about fifty miles, and Mr. Patterson is of the belief that the entire population in some former period must have been suddenly extirpated by a great volcanic eruption. He thinks at one time the crater of these mountains was sixty miles long and from fifteen to twenty miles across, an eruption from which would destroy every living thing within a hundred miles. The only idea we can form of its destructive influence is by the ruins seen on every hand. In that dry atmosphere, where it rains only between the months of June and July, wood and animal remains are long preserved, and that so little is preserved of this ancient people gives us a good idea of the ruin that ensued.

All over Western New Mexico are ruins of former cities, inhabited once perhaps by the same races who reared similar cities in Arizona and Southwest Colorado, and closely resembling them in structure and plan. Some of these are massive stone fortresses of great extent, and would now be impregnable against everything except modern artillery. Among these, two are

especially worthy of notice as being well known to travellers. One is the extensive stone fortifications at the eastern base of the Sierra Pajarito, on the southern border of Lincoln county; the other the large and massive ruins in Socorro county, east of the Mesa Jumanes, known as "*La Gran Quivira*." These ruins are large enough for a large city, and Mr. S. W. Cozzens, who visited them in 1859, says that the city must have had not less than 60,000 inhabitants. The ruins extended for miles, and showed that while it had undoubtedly been a large city before the advent of the Spaniards in 1540, it had been captured by them, as the ruins of two large stone churches, over which the arms of Spain were carved, fully demonstrated. There were also extensive ruins of an ancient temple like the *Casas Grandes* on the Gila, which we have noticed under Arizona. The *Acequia* or aqueduct, which had brought water for this city, was traced fourteen miles into the mountains to a very large spring. It was built of stone and laid in cement, and was an admirable piece of engineering work. There were traces also of silver mines which had been worked for a long time, but with very imperfect tools. The city was undoubtedly one of the "seven great cities of Cibola." About eighty or ninety miles south of *La Gran Quivira*, on the plain east of the Organ Mountains, in Doña Ana county, is one of those rock cities, carved by the winds and waters into the semblance of a city with its massive wall, its churches, cathedrals, castles and towers, its broad streets and its numerous dwellings, all carved out of a soft white sandstone, and so perfect an imitation as to deceive any one at a little distance. Near this are salt lakes, the salt of which is very pure, and extensive fields of gypsum, some of it in the crystallized form of selenite, which was used instead of glass for lighting the best dwellings of these ancient cities. In the "*Mal Pais*" or Bad country, in Socorro county, east of the Rio Grande, are vast deposits of fossils as remarkable as those of Colorado, Nebraska or Montana.

In 1879 the Smithsonian Institution sent a small party of ethnologists into New Mexico for the purpose of exploring the ancient Pueblo ruins of the valleys of the Rio San Juan and the Rio Grande del Norte, and of making extensive collections of

antiquities and objects of aboriginal interest for the National Museum at Washington. The party, while in the vicinity, visited the ancient town of Zuñi, where they have succeeded in gathering together upward of two thousand specimens of modern pottery, stone implements, images, costumes, etc. Scattered through the valley of the Rio Grande del Norte are nineteen Pueblo villages, which were in existence long before the discovery of America; and the inhabitants to this day preserve their old traditions and arts comparatively uninfluenced by the innovations of civilization.

The pottery manufactured in the town of Zuñi is exceedingly interesting, and is almost identical with the very ancient ware which is found among the stone ruins which abound throughout that section. Attention has been called to this ware by Lieutenant A. W. Whipple, in the third volume of the Pacific Railroad Reports, and more recently by Professor F. V. Hayden, in one of his reports of the United States Geological Survey of the Territories (1876). In the latter are figured several fine water vessels in the forms of owls, hawks, ducks and domesticated fowls. The collection made by the Smithsonian party includes many animal forms and hundreds of specimens of almost every conceivable shape, scarcely any two of them being similar. It is, without exception, the finest and most complete collection of modern Pueblo ware in existence. The methods of manufacturing this pottery are exceedingly interesting, and a study of them throws much light on the ancient Pueblo art, which produced the most superior aboriginal ware yet discovered within the limits of the United States. The clay is procured from the neighboring mesas, and the vessels are moulded entirely by hand. When an unusually fine piece is being made, the clay is wet and smoothed by the lips of the potter, who then sets the vessel aside to dry. The paint is put on by a brush, and then burned in an oven surrounded with dry manure.

In the Pueblo of Laguna pottery is made in a similar manner. A private collection, just received in Philadelphia from there, contains a number of vessels in imitation of ducks, setting hens, etc. Such objects, while ornamental, are designed for use also,

and are employed in carrying water on journeys. A common ornament on this ware is a painted representation of the elk or deer, in which a passage invariably extends from the mouth to the heart, which latter is of triangular form. The tenahas, or earthen basins, are used as receptacles for meal, corn, water, or other substances which constitute the food of the natives. One very old vessel is covered with representations of snakes, a rare figure in the ornamentation of Pueblo ware, since the priests or medicine men no longer permit the people to employ the sun or serpent symbols, but monopolize them in their incantations and stately ceremonies. Tenahas are made of all sizes, from an inch in diameter to those that will hold from twenty to thirty gallons. Each large vessel has a concave bottom, like a champagne-bottle, for steadying it on the head in carrying water from the well.

The clay used in the manufacture of the Laguna pottery is of a dark slate color and exceedingly compact, oftentimes approaching soft rock in texture. This is taken from seams or veins in the mesa walls. The Indians soak this clay in water for two or three days, when it becomes perfectly plastic. It is then kneaded with the feet of the workmen on a large flat stone, and all the hard lumps are taken out carefully. After the vessels are moulded into form they are left to dry, and then covered with a ground work of white paint. Over this are painted fanciful devices in red, orange and black. The lustre of the ware is imparted by polishing the paint, before baking, with an exceedingly smooth stone like an ordinary seashore pebble. The brown or black pigment is made from a black stone somewhat resembling hematite. This is ground fine, mixed with water, and violently agitated for some time. It is then poured from one vessel to another to remove all grit, and is applied to the surface of the vessel to be ornamented, as common paint, with a stick. This paint alone would rub off, but to prevent this it is mixed with the residue of two plants or weeds boiled together for a long time until it becomes of the required consistency, after which it is allowed to cool; it then becomes perfectly hard. The clay employed for the red color is of a yellowish tint, but on being

baked changes to a brilliant red. The process of burning or baking consists in first placing the vessels on stones, around which is packed a quantity of dry barnyard manure, which is considered the best fuel. The vessel is covered completely with this substance, so as to exclude the air, and a very hot fire of two or three hours' duration is produced. During the process of burning the vessels are closely watched, and no portion of them is permitted to become exposed to the atmosphere.

The pottery of Laguna, and in fact of most of the other Pueblo villages, is almost entirely made by the women, who expend much of their leisure time in moulding and decorating the ware. The particular interest which attaches to the Pueblo pottery is in the fact that these people of New Mexico and the Moquis of Arizona are the only aboriginal tribes in the United States that still practise their old arts, unchanged by the influences of civilization.

Manufactures.—Very little is done in the way of manufactures, though the Pueblo Indians and the Mexicans are both ingenious; and with very imperfect and rude tools will produce remarkable results. The jewelry produced from native gold and silver is of remarkably artistic designs, as is the native pottery. The *serapes* and blankets made from the coarse wool of the Mexican sheep or the hair of the goat are of excellent quality, and so dense that water cannot percolate through them. The saddles, stirrups and horse fixtures generally are of excellent quality, and the better sorts have a good deal of bullion, and a rude, barbaric splendor about them. Beyond these articles there is very little which can be called manufactures. The rude *bateas*, or wooden bowls, which were their substitute for the pan and the rocker of the placer miner, and the *arastras*, great boulders, bound to the arms of the central capstan, with which they ground their quartz rock to powder, constituted their sole mining apparatus; they had even forgotten how to construct the rude adobe smelters, which the Indians used three centuries ago. But with railroads and railroad towns all over the Territory, there will come in manufactures, and builders, architects, machinists and engineers will be found in great numbers through the Territory.

Historical Data.—New Mexico was first heard of in Europe in 1530 as the Kingdom of Cibola, from whence the Mexican rulers obtained their gold and precious gems. It was reached in 1540 by Coronado, but did not come fully under Spanish domination until near the close of the sixteenth century. The foreigners were well received at first, but they soon became obnoxious to the people. The religious and civil authorities were alike greedy for gold, and the gold mines were made to yield immense sums to the church and the rulers, by the enslaving of the natives, and the practice of the most atrocious cruelties upon them. The cathedral of Santa Fé alone received from one mine \$10,000,000. At last, exasperated beyond endurance, the long-suffering natives rose in rebellion in 1680 and expelled the Spaniards, but only succeeded in keeping them out for thirteen years. During this time every mine in the country was filled up. Peace was made on condition that there should be no more slavery and no more mining. From that time until 1846, when the American army took possession of the Territory, the history of New Mexico is almost a blank; things went on the same from generation to generation. The governors of New Mexico were practically independent by their isolation; and the revolution which threw off the Spanish yoke from Mexico made very little difference with this remote State. In 1846 General Kearney captured Santa Fé, and overran the entire Territory, which was ceded to the United States two years later under the treaty of Guadalupe-Hidalgo. The land south of the Gila was obtained in 1853 by purchase from Mexico, and in 1854 New Mexico contained, besides the region within its present limits, the whole of Arizona and portions of Nevada and Colorado. So much of the country east of the Rocky Mountains as lies between the thirty-seventh and thirty-eighth parallels was annexed to Colorado in February, 1861, and, two years later, Arizona was set off. Several attempts have been made to secure the admission of New Mexico to the Federal Union, but so far without success. A bill for that purpose was presented to the Forty-third Congress in March, 1875, but failed to become a law. Until it can come in

as a State having a republican form of government and not under the control of a religious hierarchy and an established church, it is to be hoped that all future applications will prove equally unsuccessful. But the vast tide of immigration now flowing into the Territory, and which is likely to be still larger, will soon effect such changes that its reception into the Union will be both proper and desirable.

Conclusion.—There is no use in counseling immigrants to avoid a region so rich in mineral wealth, or so well adapted to pastoral pursuits, as New Mexico; but there is a sufficiency of these advantages to last for several years to come; and the immigrant who delays until the Indian troubles are fully settled, and the country, and its railways and highways, its government, schools and religious advantages are more fully developed, will be wiser than those who, in their haste to be rich, rush in now, and find, as they will, that wealth is only to be purchased by great trials, privations and sacrifices.

CHAPTER XVII.

OREGON.

OREGON is one of the States of "The Picturesque West," situated on the Pacific slope, and, except Washington, is the most northwesterly of the States and Territories comprised within the limits assigned to that "Empire." It is between the parallels of 42° and 46° 18' north latitude, and between the meridians of

116° 33' and 124° 25' west longitude from Greenwich. It is bounded on the north by Washington Territory, the Columbia river forming the boundary to the point where that river crosses the parallel of 46° and the boundary running thence eastward, along that parallel, to the Snake river; on the east it is bounded by Idaho Territory, the Snake river forming the boundary to the mouth of the Owyhee, and thence a line drawn due south along the meridian of 116° 50' west longitude to the Nevada line; on the south it is bounded by Nevada and California, the parallel of 42° forming the boundary line; on the west its shores are washed by the Pacific Ocean. Its greatest width from east to west is 360 miles, and from north to south 275 miles; while its coast line is about 300 miles. Its area is 95,274 square miles, or 60,975,360 acres. It is a little larger than the two States of New York and Pennsylvania.

Face of the Country.—The principal mountains of Oregon, those having the highest summits, are the Cascade Mountains, a continuation of the Sierra Nevada of California, which stretch across the State from north to south, at an average distance of about 110 miles from the coast of the Pacific. Numerous barren snow-capped peaks of volcanic origin rise from them to great heights within the limits of Oregon, of which the most elevated are Mount Hood (11,025 feet), Mounts Jefferson, Thielsen, Scott, Pitt and the Three Sisters. The Cascade Range divides Oregon into two distinct sections, known as Eastern and Western Oregon. Of these the former contains by far the most territory, but the latter is far more advanced in settlement; and within its natural boundaries, that is, between the Cascade Mountains and the Pacific coast, more than seven-tenths of the present population of the State are living.

Another chain of mountains, the so-called Coast Range, extends also north and south, over Western Oregon, at a distance varying from forty to seventy miles from the Cascade Mountains, and proportionately nearer to the Pacific coast. Its elevation is, however, much lower than that of the latter, its highest points being only a few thousand feet above the level of the sea. Eastern Oregon is subdivided, so to speak, into Middle Oregon

and Eastern Oregon proper, by the Blue Mountains; a range with a general northeast and southwest direction, at a distance of about 150 miles east of the Cascade Mountains. A chain known as the "Western Spur" of the Blue Mountains extends at right angles with the main chain of the Blue Mountains, in a direction from northwest to southeast, from the mouth of Trout creek, on the Des Chutes river, to the Malheur river, and a parallel but shorter chain extends from Camp Curry to Crooked lake.

The Cascade Mountains, in conjunction with the Coast Range and the numerous chains of hills flanking and skirting and running out from them, divide the surface of Western Oregon into numerous valleys of varying extent, traversed by more or less important water-courses.

The largest rivers of Western Oregon are the Columbia, which separates it on the north from Washington Territory; the Willamette, the largest tributary of the Columbia; Young, and Lewis and Clarke rivers, also flowing into the Columbia; the Umpqua and Rogue, Tillamook, Yaquina, Alseya, Siuslaw and Coquille, emptying into the Pacific; and the Tualatin, Clackamas, Yamhill, Santiam, Luckiamute, Mary and Long Tom rivers, all tributaries of the Willamette, which itself is formed by three separate streams, known as McKenzie's, Middle and Coast forks.

The principal water-courses of Middle Oregon are the Des Chutes, John Day's and Umatilla rivers, and their numerous tributaries, the waters of which unite with the Columbia.

The principal river of Eastern Oregon proper is the Snake river, which separates Oregon from Idaho, and its main tributaries, the Grande Ronde, Powder, Burnt, Malheur and Owyhee rivers.

There are numerous lakes in Southeastern Oregon, the principal of which are the Klamath, Goose, Malheur and Warner's lakes, Lake Harney, Silver, Summer, Albert, Christmas and Guano lakes.

Among the distinctive features of Oregon are the numerous valleys formed, as already stated, by the several mountain chains and the minor ranges issuing from them.

The principal valleys of Western Oregon are those of the Willamette, Umpqua and Rogue rivers, each of which deserves particular mention.

The Willamette valley is by far the largest, and in every respect the most attractive. It has been appropriately named "the garden of the Northwest." None of the famous valleys of the Old or New World, not even that of the Nile, or the Sacramento, San Joaquin or Santa Clara valleys of California, surpass it in fertility or salubrity. In beauty of scenery its equal is not to be found anywhere. The Hon. Schuyler Colfax, late Vice-President of the United States, who visited it some years since, enthusiastically pronounced it "as charming a landscape as ever painter's hand placed upon canvas." It is about 150 miles in length, from thirty to sixty miles in width, and contains within its natural boundaries—viz.: the Columbia river on the north, the Cascade Mountains on the east, the Coast Range on the west, and the Callapoia Mountains on the south—about 5,000,000 acres of unusual productiveness, of which only a part is as yet under cultivation. It is well watered throughout by the Willamette river and its tributaries. This valley was the first portion of Oregon to be settled, and will always be the Eden of the Pacific. A few years ago it contained two-thirds of the population of Oregon, but within the past decade other portions of the State have been rapidly settling up, and its population, though large and permanent, does not bear as large a proportion to the whole as formerly.

The Umpqua valley lies to the south of the Callapoia Mountains, and is watered by the Umpqua river and its tributaries. Its eastern boundary is formed by the Cascade Mountains, its western by the Coast Range, and its southern by the Grave Creek Range. It contains about 2,500,000 acres.

To the south of the chain of mountains last named lies the Valley of Rogue River, which has the same boundaries to the east and west as the two other valleys described, and is bounded on the south by the Siskiyou Mountain, which separates it from California. Its area is about 2,400,000 acres. There are several other smaller but fertile valleys, the bottom lands of the numerous small streams which fall into the Pacific.

Middle Oregon has no great agricultural valleys, the region between the Cascade Range and the western spur of the Blue Mountains being almost wholly composed of high rolling plateaux, and the Des Chutes river, as its name implies, flows through deep and narrow cañons, with numerous rapids and cataracts. At the sources of the Des Chutes there is an extensive sage desert, but the sage after being touched with the frost is very much liked by cattle, and forms an excellent forage for them, so that the "Sage Desert" proves to be excellent grazing ground. This whole region of the plains has been found to be admirably adapted to grazing, and portions of it are among the most productive wheat farms in the State.

Eastern Oregon abounds in fertile valleys, which yield immense crops. The *Commercial Reporter* gives a list of twenty-two (not one-half of those which are known there), which have an area of 5,891,200 acres, every foot of which is very fertile. These valleys will soon have good access to markets over narrow-gauge roads, now in course of construction by the Oregon Railway and Navigation Company to La Grande, Baker City and Sparta, which will connect them with Portland, Oregon, by rail or steamer, and very soon also by the way of the Northern Pacific with the East.

The Surveyor-General of Oregon, Hon. James C. Tolman, speaks as follows of those sections of the State which have hitherto been least known, in his report to the Land Office, August 15, 1879:

"A small portion of Southwestern Oregon is quite mountainous, and is mostly adapted to mining and grazing. The area of this class, however, is comparatively small, and generally contains sufficient arable tracts to furnish supplies of garden products for local use.

"That portion of the district east of the Cascade Range and north of the Blue Mountains, generally known as Northeastern Oregon, consists principally of high, rolling table-lands, with occasional river and creek bottoms, and, with the exception of the eastern and northern slopes of the mountain ranges mentioned, is scarce of timber. It comprises an area of generally arable land,

of about forty by eighty miles in extent, is rapidly settling up in the more eligible locations, and is certain, in the near future, to become a vast wheat-growing region. Where, but a few years ago, only the Indian or the trapper found inducement to remain, is now the scene of busy activity and great attraction. It is in this region that timber is now in most demand, and dependence is upon the adjacent mountains. There they can cut and saw timber for rails and lumber and draw or raft it to the farms below, and it is here that timber depredations have been most frequent. The land has mostly remained unsurveyed where the timber grows, and the citizens could not purchase it, or procure the use of it, even by the payment of 'stumpage;' but they felt that they must have timber. The central portion of Eastern Oregon is mainly mountainous, with occasional valleys and water-courses adapted to settlement and utility. This tract is bounded on the north by the Blue Mountains, on the west by the Cascade Range (the latter extending entirely through the State from north to south), on the east by Snake river, and on the south by the spurs and buttes of the Cascade and other ranges of mountains, embracing a tract of country near 150 miles square. Although mainly devoted to mining at this time there are yet large tracts of this district that are good arable land, and which will, in the course of time, be surveyed and taken up by settlers. At this time it is so far removed from market that it affords little attraction to other than stock-raisers and miners, excepting a narrow strip along the one overland thoroughfare.

"Southeastern Oregon comprises about one-fourth the entire area of the State, and is mainly adapted for grazing. It is here that are annually reared and fattened the beeves which furnish the markets of California, Utah, Nevada and most of Southern Oregon. There are numerous small valleys, however, which are of most excellent agricultural quality, and will be more than sufficient for all time to furnish the local demand for produce. This portion of the country is composed principally of vast grassy plains, interspersed with low wooded hills, and thickly set with beautiful lakes. Scattered over it are some marshes and swamps,

many of which are susceptible of easy reclamation, and when once redeemed will add that much to the already abundant meadow land. There are no extensive belts of arid land in Oregon, only at long intervals small tracts of desert, and these generally reclaimable. Such tracts as could be thought worthy of the name exist only in the imagination of those really unacquainted with the country."

Soil and Vegetation.—In Western Oregon, both mountain and valley have good and productive soils, the valleys being very rich, the mountain slopes hardly less so; while the mountains are rich enough to be covered with gigantic growths of timber to their summits, or where this has been burned, with a dense undergrowth, indicating its productiveness. The general character of the soil in the valleys is a dark loam and vegetable mould with a clay subsoil. The soil of the bottom lands, contiguous to the water-courses, is generally composed of rich alluvial deposits of decomposed earth and vegetable mould. The so-called beaver-dam lands have deep accumulations of *humus* or earthy deposits, decayed vegetable matter and decomposed trees, the work of beavers during centuries, and are of extraordinary fertility, but are of limited extent. Most of the lands in the larger valleys have a rich, very deep soil. This is especially true of the level and rolling prairies between the river bottoms and foot-hills. Besides the large valleys of the Willamette, Umpqua and Rogue rivers, and their tributaries, those of the Young, Lewis and Clarke, Nehalem and Coquille rivers, and of Skippanon creek, the basins of Tillamook and Yaquina bay, and the so-called Clatsop plain, offer fine fields for agricultural pursuits in Western Oregon. The action of the clay subsoil in retaining moisture accounts for the exceeding productiveness of the soil. The land, too, retains its productive capacity for unusually long periods of time, and seems, indeed, all but inexhaustible. Even after having produced crops of wheat, oats and barley, for from fifteen to thirty years, without any manure, and with indifferent ploughing, it remains as fertile as ever.

The soil of the foot-hills and tillable mountain surfaces consists of red, brown, or black loam; the black predominating near

the mountain ranges. The elevated lands not only afford the best natural pasturage, but produce good crops of hay, cereals, vegetables and fruit.

In Middle Oregon soil for agricultural purposes is not so generally good on the elevated plateaux as west of the Cascade Mountains; the best openings are in the valleys along water-courses. In some parts of these districts, artificial irrigation has to be employed to make the soil productive, and with this stimulus, they yield enormous crops.

In Eastern Oregon, the river valleys are rich, and most of the land, even in the uplands, is a strong alluvium, producing from thirty to sixty bushels of wheat, a like proportion of other grains, and immense root crops. These lands are new, and their productiveness has not been known until within the past five years. The Cascade Mountains, the Coast Range, and the Callapoia Mountains, as well as a large part of the valleys of Western Oregon, are covered with mighty forests, affording an inexhaustible supply of hard and soft timber. In the valleys different kinds of ash, oak, maple, balm and alder, as well as fir, cedar, spruce, pine and yew, grow in great abundance. In the foothills scattering oaks and firs, with a thick second growth in many places, are found. The mountains are mostly covered with thick growths of tall fir, pine, spruce, hemlock, cedar, larch and laurel, without much undergrowth. Two kinds of cedar, two of fir, and three of pine, are indigenous to Oregon. Trees attain an unusually fine development, both as regards height and symmetrical form. In the northern part of the State the red fir abounds, and often measures two hundred to two hundred and fifty feet in height, with trunks nine feet in diameter, clear of branches up for one hundred to one hundred and fifty feet. Out of such trees eighteen rail-cuts have been made, and five thousand to ten thousand feet of lumber. Elder stalks from eighteen to thirty inches in circumference, hazel bushes from one to five inches in diameter, are of common occurrence. Lumber is cut from elder saw-logs measuring twenty to thirty inches in diameter. In the forests south of the Umpqua the yellow pine is found, as also an abundance of sugar pine, the wood of which is in great demand.

For commercial and industrial purposes, the red cedar, red fir, hemlock, sugar pine, maple and ash, are the most valuable. The natural grasses of Western Oregon are of fine quality and retain their nutritious and fattening character till late in the autumn. The rains which fall regularly in May and June keep the pasture in a succulent condition through the later summer and autumn. One acre of this natural pasture will feed a sheep through the year, and two acres an ox. But the best grazing lands are found in Middle and Eastern and especially Southeastern Oregon. There are a great variety of native grasses of the most nutritious character in this vast pasture-ground, which comprises about thirty-three million acres. The cattle and sheep pastured on these grasses thrive better than those fed on grain in the east. The only difficulty is that they become too fat. These lands, where they are moderately accessible to a market, are being taken up extensively for dairy farms, and the golden Oregon butter has already a high reputation on the Pacific coast.

Water Supply.—Western Oregon, with its immense annual rainfall, its streams fed from the snow on the Cascade Mountains, and the moist breezes swept in from the Pacific, is in no want of water. Lakes, ponds, and fine springs abound. In Middle Oregon, on the elevated plains, there is sometimes a scarcity, and occasionally irrigation is necessary, but the facilities for this are so ample, the cost of irrigation is so moderate, and the results produced by it so vast and profitable, that irrigation is not a drawback to the cultivation of these lands. In Eastern Oregon the rainfall, though less copious than in the western portion of the State, is sufficiently so for all practical purposes, and the beautiful valleys there do not suffer from drought.

Climate.—The climate of Western Oregon is mild and equable, differing in this from that of the Eastern States, that it is neither too hot in summer nor too cold in winter. Owing to the proximity of the Pacific and the Gulf stream of that ocean, snow or frost never prevails to any considerable degree. The average temperature explains this fact. The average for spring is 52°; for summer, 67°; for autumn, 53°; and for winter, 39° Fahrenheit, showing a mean deviation of only 28° during the year. The

average yearly rainfall is forty-four inches, about the same as at Davenport (Ia.), Memphis and Philadelphia. Thunder-storms are almost unknown in Western Oregon, and the disastrous hurricanes and whirlwinds of the Atlantic States entirely so.

Eastern Oregon has a dryer climate, a considerably smaller rainfall, a somewhat greater heat in summer and a lower temperature in winter, assimilating very closely in these respects to the Red River valley of Minnesota and Dakota, though in general with less depth of snow in winter. But this climate is eminently healthful, and the smaller rainfall does not interfere with the production of the largest and finest crops of wheat grown anywhere.

Middle Oregon has a more equable climate and a moderate rainfall, but on its elevated plateaux both the cold and the heat are felt all the more keenly, that there is no kindly forest to shelter and protect the traveller from the hot rays of the sun, or the biting cold of the winter winds.

Rheumatic and pulmonary diseases are excessively rare in all parts of Oregon. There are in some of the lowlands near rivers and lakes in Southern Oregon occasional sporadic cases of a mild intermittent fever, but they are never severe enough to be serious, and they yield rapidly to treatment. Some of the small towns on the Pacific, like Astoria, Port Orford and Umpqua City, have a much greater rainfall than the towns of the Willamette valley. In these towns, in the past, the annual rainfall has reached sixty-four, sixty-six, or sixty-seven inches, but the Coast Range robs the weeping clouds of the skies of the coast of a part of their superabundant moisture.

According to the census of 1870, the death-rate in Oregon is lower than in any other State or Territory in the Union, excepting Idaho, being only .69 per cent. of the population: while in California it is 1.16; in Vermont, 1.07; Massachusetts, 1.77; Indiana, 1.05; Illinois, 1.33; Kansas, 1.25; and Missouri, 1.63.

The equable temperature, the absence of high, cold winds and sudden atmospheric changes, render people less subject to bronchial, rheumatic and inflammatory complaints than in other parts of the country, where the extremes of heat and cold are

greater, and the changes of temperature more sudden and violent.

We give on page 1102 the meteorology of Portland, Oregon, representing the northwest region of the State; of Roseburg, representing the southwest, and of Umatilla, on the Columbia, in the northeast. We have no reports from the southeast, but only know from the correspondence of those who have lived there, that the climate has very much the same characteristics as that of Eastern Oregon generally. We give also the average temperature and rainfall of Astoria and Corvallis, representing the extreme northwest, at the mouth of the Columbia, and Western Central Oregon in the Willamette valley.

Portland, average temperature of five years: Spring, $51^{\circ} 9'$; summer, $65^{\circ} 3'$; autumn, $52^{\circ} 8'$; winter, $40^{\circ} 1'$. Annual rainfall for five years: 43.41; 53.12; 43.69; 41.45; 47.70.

Astoria, latitude, $46^{\circ} 17'$; longitude, $123^{\circ} 50'$. Mean temperature for ten years: Spring, $51^{\circ} 16'$; summer, $61^{\circ} 36'$; autumn, $53^{\circ} 55'$; winter, $42^{\circ} 43'$; year, $52^{\circ} 13'$. Annual rainfall, 60 to 67 inches.

Corvallis, latitude, $44^{\circ} 35'$; longitude, $123^{\circ} 08'$. Mean temperature for ten years: Spring, $52^{\circ} 17'$; summer, $67^{\circ} 13'$; autumn, $53^{\circ} 41'$; winter, $39^{\circ} 27'$; year, 53° . Annual rainfall, 38.47 to 42.08 inches.

Geology and Mineralogy.—Much of the area of Oregon has been subjected to volcanic action on a grand scale, and in Eastern Oregon this has been comparatively recent (though probably not within the historic period), and on the most stupendous scale. The Coast Range and the Blue Mountains and their spurs are both eozoic; the intermediate Cascade Range is volcanic in its surface rocks, with indications that these metamorphic rocks were originally limestones and sandstones. The volcanic action in Eastern Oregon was so violent as to leave deep fissures or cañons where the rocks were rent. Some of these cañons are 1,500 feet deep, and on their perpendicular walls there is a record of the order of the geologic strata rarely accessible elsewhere. Near the bottom of the fissure are the cretaceous beds, abounding in marine shells, preserved in perfect form, but often filled

with chalcedony or calcareous spar; next above, the lower tertiary strata, with leaf impressions of great trees—of palms, yews and giant ferns, as well as of the oak leaf and acorn; with these are associated fossils of two species of rhinoceros, four of the *oredon*, a connecting link between the camel and tapir, and several genera of the tapir and peccary families; and with them the *orohippus*. Upon these lower tertiary strata supervenes the period of volcanic action, with a vast overflow of lava, mud and ashes. The region thus rent is heaved elsewhere into isolated cone-like hills, or ridged with secondary rocks, thrown up dike-fashion, their strata contorted into sharp angles or broken into chasms filled with earth or lava. Here are mountains of amygdaloid, heaps of volcanic conglomerate, and cliffs of columnar basalt walling in the water-courses. In the region of the upper Des Chutes and John Day rivers, the volcanic action is less marked, and here the cretaceous formation approaches the surface. The whole of the Cascade Range in the State gives evidence of volcanic action, and this extends westward into the Willamette valley. The bed of the Willamette river near its mouth is partially basaltic, with perpendicular walls; south of Oregon City it traverses a district of volcanic *débris*, and black trap is frequently exposed on its banks. Southward of this occur thin strata of limestone, with fossil bivalvular shells, granite *in situ*, and again basalt. The prevalent rock of the Willamette valley is trap, while at the head of the valley a light-colored clayey sandstone, possibly tertiary, is found. The fossil teeth and tusks of elephants have been found at great depths in the same valley. At the Dalles, on the hillsides, are boulders of gray and of a red granite.

Minerals.—The mineral wealth of Oregon is very great, but as yet very imperfectly developed, mainly owing to the want of capital. Gold was first discovered in 1851, in the counties of Jackson and Josephine, in the extreme south of the State; and mines have been worked in them ever since. Their total product up to the present time is estimated at \$27,000,000; but of late years the yield has declined in consequence of the want of water. Baker and Grant counties, in Eastern Oregon, have also yielded

many millions of the precious metal. In Baker county, especially in the vicinity of Baker City, gold mining is carried on very actively at this time, and with good results. On the ocean beach, near Coos bay, placer mines are worked to a considerable extent. Rich gold quartz lodes have been discovered and partially worked in the southern part of the Cascade Mountains; but their distance from railroads, and the want of machinery for working them, has, until now, prevented their development on a scale commensurate with their richness. Were the same amount of capital, enterprise and trained skill brought to bear upon the gold mines of Oregon, that is now again increasing the gold product of California at a rapid rate, after years of decline, the former State would not be far behind the latter in the production of precious metals. The yearly gold product of Oregon represents now a value of nearly \$1,500,000.

Lead and copper have been found in large quantities in Jackson, Josephine and Douglas counties, on Cow creek, a tributary of the Umpqua, and also on the Santiam river. The mines on the latter river are successfully worked.

Large deposits of rich iron ore exist in nearly every part of the State. The most important of these is situated near Oswego, on the Willamette, about six miles south of Portland. The ore from it yields about fifty-four per cent. of pure iron. Other extensive deposits exist in the counties of Columbia, Tillamook, Marion, Clackamas, Jackson and Coos. A large bed of ore has been found at St. Helen's, on the Columbia.

That essential element in the development of mineral resources, coal, abounds in Oregon no less than iron. Beds of great thickness exist on Coos bay, in Coos county, on the northern Umpqua, and in Douglas county. Beds, as yet but partially explored, have been found on Yaquina bay, at Port Orford, near St. Helen's, on Pass creek, and on the line of the Oregon and California Railroad, and at different other points in Clackamas, Clatsop and Tillamook counties. But only a few of these coal mines are regularly worked. The Coos bay mines keep a fleet of schooners busy carrying coal to San Francisco, where it is highly esteemed, and brings about \$11 a ton. With the exception of that obtained

from the Queen Charlotte Islands, it is the best coal produced on the Pacific coast.

What, with the abundance of coal and the immense beds of iron ore, the day cannot be far distant when Oregon will have a well-developed iron industry.

There are also quarries of limestone, brown stone and marble in the State.

Of the present outlook for gold and silver mining in the State, one Surveyor-General, Hon. James C. Tolman, said in his report

"The mining interests of Oregon are assuming an importance and permanent assurance of profit not heretofore exhibited. Gravel mining is being extensively prosecuted in some districts with the aid of the most approved and extensive machinery, although the past year only has been witness to their general introduction. A new era has undoubtedly dawned upon that industry in this State. The existence in Southern and Middle Eastern Oregon of immense deposits of auriferous gravel has long been known; but prospectors and men seeking only shallow surface diggings in connection with water do not generally have the capital and enterprise necessary to prosecute hydraulic mining of the modern kinds. Within the past two or three years capital has been attracted to these deposits, wherein in two counties of Southern Oregon alone I am credibly informed that many hundreds of thousands of dollars have been expended in opening up claims—in the constructing of ditches and arrangement of machinery principally. Much labor and time, as well as money, is required to develop and put in paying order any of these claims, and although numbers of them are now in working order, few or none of them have yet been sufficiently tested to develop their real worth. A full 'clean up' is the only fair test of value, even after months of labor and many thousands of dollars of expenditure.

"This must be ranked mainly as an agricultural State, though mining is, and will indefinitely continue to be, a large factor in the sum of our productions, both in gravel and quartz mining. Our people have never been subjected to the emotional risks

occasioned by stock boards and wild cat speculations which have swept other mining regions, and are thus more disposed to weigh the chances of profit in any enterprise offering inducements. Hence our mining interests have lagged, only to be placed upon a profitable basis when undertaken at all.

"The quartz mining of this district has also attracted a renewed share of attention. Heretofore, with but few exceptions, this class of mining has been lightly employed, and has yielded but small returns, for precisely the reasons which have been offered in regard to the small effort expended in placers. Some wonderfully rich deposits were discovered many years ago, and were worked with immense profit. Notable among them were the Gold Hill and Steamboat or Fowler lands, in Jackson and Josephine counties respectively. From these, by the ordinary processes then in use, several hundred thousands of dollars were taken from the surface rock alone in the space of a few months. In one instance, from the Gold Hill ledge, one gentleman secured a trifle over 1,600 pounds of surface rock, from which he took \$30,000. When these surface deposits were exhausted (nearly twenty years ago) by crushing in 'arastras' and other almost equally primitive methods, and the serious and expensive work of sinking shafts, driving tunnels, etc., began, those mines were abandoned and have lain idle till this day, with the exception of an effort now being made to resume work on the Steamboat.

"In Eastern Oregon quartz mining has been steadily followed, in a small way, by gentlemen of limited means, for a number of years, yielding fair returns where effort merited reward. Several small mills are now in operation there, and prospecting is pushed with considerable vigor. I have no data as to average yield, but am assured that it has been uniformly satisfactory. The general outlook, however, is better now in regard to mining than it has been before for many years. In the course of time I believe this State, to the extent of its mining area, will rank with the most favored mining localities of the coast. Given the mines, and we certainly possess facilities unsurpassed by any region—cheap fuel and labor, abundance of water and plenty of all kinds of provisions, all easily obtained."

Zoölogy.—The beasts of prey are identical with those of California; the grizzly bear, black and cinnamon bears, the cougar, or panther, and several of the smaller *felidæ*, the catamount, lynx and ocelot, the fisher, otter, marten, mink and beaver, several species of fox, the gray wolf, possibly the raccoon; and of game animals, elk, deer of two species, antelope, bighorn, or Rocky Mountain sheep, rabbits and hares, including the jackass rabbit, and two or three hares found only on the Pacific coast; all the rodents of the coast; and of game birds, wild swans, wild geese and ducks of many species, pheasants, sage hens and other grouse, quail and snipe of extraordinary size, and a great variety of song birds and birds of prey. The waters of Oregon abound in fish of great delicacy and economic value. There are six or seven species of salmon native to the coast; and the Eastern salmon and lake salmon have been introduced. The salmon forms an important item in the products of the State. Trout of great size and excellence are found in the streams; sturgeon, tom cod, flounders and other edible fish are abundant. The shad and black and sea bass have been introduced. Most of the edible shell fish are found in great abundance on the coast.

The Timber and Lumber Trade.—The magnificent forests of Oregon supply an immense amount of timber and lumber for San Francisco and other California ports, and also for the Mexican and South American markets. For ship-building, mine-timbering and house-building, as well as for the choicest furniture, the Oregon woods are the best in the world.

Historical Data.—Spain seems to have had the first title—that of maritime discovery—to Oregon and Washington Territory, having visited and mapped the coast nearly to the fifty-fifth degree of north latitude, in 1592 by the Greek pilot, De Fuca, in 1640 by Admiral Fonte, and subsequently by other explorers. This title, with whatever validity it possessed, was expressly conveyed to the United States by Spain by the treaty of Florida, concluded in 1819. The title of the United States to Oregon and Washington Territory by no means, however, rested on this alone. Other valid claims were the following: the discovery and explo-

ration of Columbia river by Captain Robert Gray, commanding the ship "Columbia," in 1792, who gave the name of his ship to the river; his previous exploration of the coast in connection with Captain Kendrick, in the "Washington" and the "Columbia," and his discovery and naming of Gray's Harbor, and exploration of the Straits of San Juan de Fuca and Puget Sound, more fully detailed in the chapter on Washington Territory; the purchase of Louisiana and all that belonged to it from the French in 1803, this including the Spanish title so far as they had received it from the French in 1762;* the exploration of Columbia river from its sources to its mouth by Captains Lewis and Clarke, by order of our government in 1804, 1805, and its continued occupation by American citizens from 1810, as a result of the knowledge of its resources gained from the report of Lewis and Clarke.

In 1810 the first house was built in Oregon by Captain Winship, a New Englander, but the house was carried away by a flood the following year. In 1811, John Jacob Astor, of New York, established a trading-post at the mouth of the Columbia river, which was named "Astoria" in his honor. The venture proved disastrous, mainly in consequence of the war between the United States and Great Britain in 1812. The British took possession of the post in 1813 and called it Fort George. Subsequently it became the property of the Hudson Bay Company, and remained in its possession until 1848. The Northwest Fur Company disputed for a time the rule of the latter company on the Pacific coast, but had to succumb in a few years, and was absorbed by its rival in 1824, from which time, till 1848, the latter ruled supreme in the valleys of the Columbia and Willamette.

In 1824 the first fruit trees were planted in Oregon, and in

* This claim to Oregon in consequence of the Louisiana purchase was a very weak one, and has been abandoned by Greenhow and some other American authorities. The great name of Thomas Jefferson, who was President when the Louisiana treaty was negotiated, has also been cited against it; but the other claims were sufficient, and their justness and completeness cannot be denied. See on this subject two very able and conclusive papers by John J. Anderson, Ph. D., author of several works on the history of the United States, entitled "Did the Louisiana Purchase extend to the Pacific Ocean?" and "Our Title to Oregon"—San Francisco and New York, 1880.

1831 the first regular attempts at farming were made by some of the retired servants of the Hudson Bay Company. In 1832 the first school was opened. Between 1834 and 1837 missionaries of various denominations arrived, bringing the first cattle with them. In 1838 the first printing press arrived in Oregon. In 1841 Commodore Wilkes visited the Columbia on an exploring expedition at the instance of the United States government.

From 1816 till 1846 the American and British governments had held Oregon "by joint occupancy" under a formal treaty, but neither nation had organized any form of civil government there. In 1843 the inhabitants organized a provisional government, which continued in force till 1848. In 1846, after a long discussion, a treaty was made with Great Britain by which the whole territory south of 49° was ceded to the United States.

In 1848 Oregon Territory was organized, and in 1849 received its first territorial governor.

In 1859 it was received into the Union as a State. Since that time it has had some Indian troubles, but these are now all quieted, by the banishment of the Indian offenders, and the location of the Indians on reservations where they are cared for and educated.

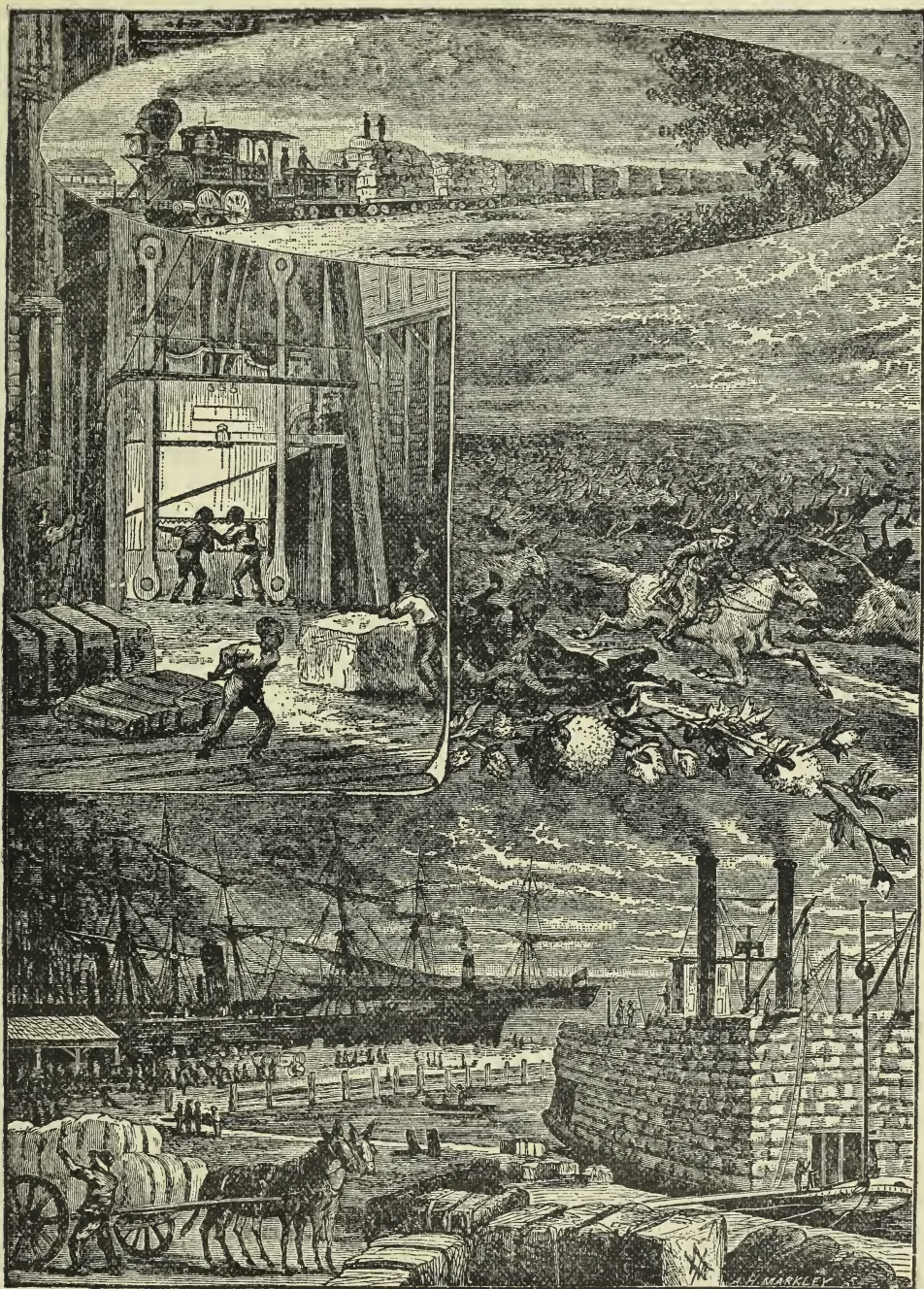
CHAPTER XVIII.

TEXAS.

TEXAS is the southernmost State of "Our Western Empire," and joins on its western border the Republic of Mexico, of which it was once an integral part. It is a vast domain, extending from the parallel of 25° 51' to that of 36° 30' north latitude, and from the meridian of 93° 27' to that of 106° 43' west longitude from Greenwich. It is of very irregular shape, a part of its boundaries being of mathematico-geographical lines of latitude and longitude, and a much greater portion following the natural lines of gulf coast, bay and river. Its northern boundaries are New Mexico from the Rio Grande eastward, to the 103d meridian, the Indian Territory (the narrow strip in the northwest of that Territory) from the 103d to the 100th meridian, and the Red river from the

100th meridian to the 94th, where it crosses the Arkansas boundary. This river separates it from the Indian Territory. Its eastern limits are the meridian of $94^{\circ} 10'$, as far south as the thirty-second parallel, Arkansas and Louisiana being its actual bounds, and from the thirty-second parallel the Sabine river and lake or estuary to the Gulf of Mexico, and the gulf itself thence to the mouth of the Rio Grande del Norte. The Rio Grande del Norte forms its southwestern border, separating it from the Republic of Mexico, as far as to El Paso, where it passes into New Mexico. The 103d meridian, passing through the Llano Estacado, forms its western boundary. Its extreme length from southeast to northwest is somewhat more than 800 miles, and its extreme breadth about 750 miles. Its area is 274,365 square miles, or 175,587,840 acres. This area is equal to that of the German Empire, with Holland, Belgium, Switzerland and Denmark added to it. It is one-third larger than the Republic of France. It is four times larger than all New England, and nearly equal to the combined area of New York, Pennsylvania, Ohio, Michigan, Indiana and Illinois.

Face of the Country.—It is a vast inclined plane, with a gradual descent from the northern and northwestern boundary to the Gulf of Mexico. The coast counties are nearly level for sixty or eighty miles inland; the surface then becomes undulating, with alternate gradual elevations and depressions, and this feature increases as we proceed toward the northwest, until it becomes hilly and finally mountainous in some of the far western counties; the Sierra Charrotte are the most eastern of these mountain ranges, and between these and the Rio Grande, in Pecos, El Paso and Presidio counties, are the Guadalupe, the Pah-cut, the Apache, the Sierra Hueco, the Sierra del Diablo, the Sierra del Muerio, the Chanatte Mountains, the Sierra Merino, the Sierra Cariso, Eagle Mountain, the Sierra Blanca, and stretching along the Rio Grande for many miles the Sierra Blanca. Most of these mountains carry leads of silver, lead and copper. The highest of them do not attain an elevation of more than 5,000 feet. In other portions of Texas there are hills, and occasionally a summit towering above the plain, but no mountains in the strict sense of the word. The gradual character of the ascending slope of the country is



COTTON TRAIN.

COTTON PRESS.
VIEW OF GALVESTON HARBOR,

CATTLE STAMPEDE.

indicated by the following elevations ascertained by the coast survey and railway surveys: Goliad, 50 feet; Houston, 65; Gonzales, 150; Jefferson, 226; Silver Lake, 350; Marshall, 377; Webberville, 394; Brenham, 435; Dallas, 481; San Antonio, 575; Fort Worth, 629; Austin, 650; Sherman, 734; Fort Inge, Uralde county, 845; Weatherford, 1,000; Sisterdale, in Kendall county, 1,000; Fort Clark, Kenney county, 1,000; Fredericksburg, 1,614; Mason, 1,800; Fort Concho, 1,750; Fort McKavitt, 2,050; Fort Bliss, El Paso county, 3,830; Fort Davis, Presidio county, 4,700 feet.

Rivers, Bays, Estuaries and Lakes.—The State, except in the region of the *Llano Estacado*, or Staked Plain, in the northwest, is well watered. The Canadian river, the largest tributary of the Arkansas, and the Red river, which forms a part of its northern boundary, both have their head-waters in Northwestern Texas and New Mexico, but neither of them receive any very large affluents in Texas, though the North, Salt, Middle and South forks of the Red river are considerable streams. Beginning now at the east, the Sabine river, which for nearly 200 miles forms the eastern boundary of the State, is a large and for much of its route a sluggish stream, with several considerable affluents; and the Neches, or Naches, a river of about the same size, runs nearly parallel with it, both discharging their waters into the Sabine lake. The affluents of these streams and of those to be mentioned interlock with each other, and though not of large size water the country well. All the rivers of Texas except the Canadian and Red river have a general direction toward the southeast; at first perhaps rather to the south-southeast, but each successive river makes a larger angle with the meridian. After the Naches come successively the Trinity, the Brazos, with several large affluents, the Colorado, the largest river of Central Texas, having its sources on the borders of the Staked Plain, and fed by a hundred or more tributaries, the Guadalupe and its large affluent the San Antonio, Mission river, Aransas river, the Nueces, with its tributary, the Rio Frio, the Aqua Dulce, and a dozen smaller streams; and on its southwest border the Rio Grande del Norte and its great tributary, the Rio Pecos.

None of the Texas rivers are navigable for any considerable distance except at high water, but by dredging and the construction of a short canal, Galveston bay and Buffalo bayou have been rendered navigable as far as Houston, fifty miles from Galveston.

Most of the so-called lakes in Texas are really estuaries and bays, and when somewhat narrower and without much current, they are called bayous. Of these bays and estuaries the principal are Sabine lake, at the mouth of the Sabine river, Galveston bay and its two arms, East and West bay, Matagorda bay and Lavaca bay, connected with it, Espiritu Santo and San Antonio bays, one opening into the other, with several small bays connected with them, Aransas and Copano bays, Corpus Christi and Nueces bays, and the Long Lagoon, or sound, *Laguna de la Madre*. The only considerable lakes not estuaries are Caddo lake, in the east, Forked lake, in Zavala county, Espantosa, in Dimmitt county, and three large salt lakes in Presidio county, in the northwest.

Divisions of the State.—The State is divided for civil and descriptive purposes into—1. The coast counties; 2. Eastern Texas; 3. Central Texas; 4. Northern Texas; 5. Western and Southwestern Texas; 6. Northwestern Texas.

In the coast counties the soil and climate are especially adapted to the culture of the sugar-cane, sea island cotton, rice and many semi-tropical fruits and vegetables.

The eastern portion of the State, including some eighteen counties, is heavily timbered, and from here are drawn nearly all the immense supplies of pine lumber required in the prairie-portions of the State. The natural resources of this section are varied. In it are vast deposits of iron ore of excellent quality and extensive beds of lignite. Large crops of cotton, corn and other grains are grown in its valleys, and its uplands are noted for the production of fruits and vegetables. It is generally well watered by streams and springs.

Central and Northern Texas, though generally a rich prairie country, is by no means devoid of a sufficiency of timber for ordinary purposes, its numerous streams being fringed with a large

growth of forest trees. It is also traversed by what is known as the upper and lower Cross Timbers—a belt of oak, elm and other timber, from one to six miles wide.

Western and Southwestern Texas are the great pastoral regions of the State. The surface is generally a high, rolling tableland, watered by creeks and ponds, but with little timber, except along the streams and on some of the hills and mountain regions of the western part, where forests of cedar, mountain juniper, oak, etc., exist.

The luxuriant growth of rich, native grasses found in this section renders it pre-eminently a stock-raising country, and as such it is unexcelled by any other portion of the continent. The precious metals and other mineral deposits are known to exist in this section of the State, and it is believed their development will be rapid when railroads shall have been built across it.

Northwestern Texas includes not only the mountainous region comprised in Pecos, Presidio and El Paso counties, but the unorganized region known as the Territory of Bexar, and Tom Green county, and sixty-three counties north of and east of these, extending up to the parallel of $36^{\circ} 30'$, and eastward to the meridian of $99^{\circ} 30'$. This region, a part of which is known as the "Pan-handle of Texas," has an area of more than 90,000 square miles, and perhaps one-third of it belongs to the *Llano Estacado*, or Staked Plain. It is not well watered, and portions of it are not watered at all except by wells. Its rainfall is very small, and the pasturage, though scanty, is nutritious where any water can be obtained. The mountainous portion is rich in minerals. Silver, lead, copper and iron are found there, and gold probably will be. If, as is proposed, the great Staked Plain is rendered habitable by water supplied from artesian wells, this will be an excellent country for pasturage. Flocks and herds sufficient to supply the world could be raised there.

Geology and Mineralogy.—Texas has never had a State geological survey; it has been once or twice attempted, but has soon failed for the want of means for its prosecution. It is said that the new constitution of the State prohibits anything of the kind—a most unwise provision, if true, as no State in the Union would

be as much benefited by such a survey as Texas. From some rapid and superficial geological reconnoissances of the State, we glean the following general view of the geology and mineralogy of the State.

Mr. N. A. Taylor, a Texan geologist, has gathered together the sum of what is known in regard to it, though acknowledging that extensive districts, like that from Bandera west to the Rio Grande, and that from San Antonio southwest to the Rio Grande, have not been explored even superficially, and that even the formations which approach the surface are entirely unknown, though they are conjectured to be Tertiary:

"The coast-belt, like that of the other gulf and southern Atlantic States, is alluvial, though somewhat less fertile than the deposits of the Mississippi delta; it is, however, well adapted to corn, cotton, sugar-cane and the tropical fruits.

"From the best data and my own observations, the Tertiary formations occupy all Eastern Texas as high as Red river, and all the lower portion of the State from the gulf 100 to 150 miles, and farther, into the interior. If there is any exception to this, it is in the remote southwest, which I have not visited. Of this great Territory, the Pliocene, or newer Tertiary, occupies the tide-water region, and a considerable portion of Eastern Texas above tide-water. All this region is low and level, and wonderfully productive when well drained and well treated. The Miocene, or middle Tertiary, appears here and there in scattered patches above the Pliocene, and is quite largely developed about Huntsville. These lands are largely sandy, and usually hilly or broken. From the melting nature of the soil they are also cut up by considerable gullies and ravines. Usually productive, but cannot resist drought. Above these comes the Eocene, or oldest Tertiary, which occupies a larger space. These lands are rolling, and contain much very graceful and beautiful scenery. The waves and swells rise higher and higher as you go north and west. This formation has a very small percentage of poor land.

"There are, no doubt, here and there, many intrusions on a small scale of older strata through these formations, but I know of

only one of any importance. That is at the place called Damon's Mound, in Brazoria, where several acres of valuable limestone rise many feet above the Pliocene which surrounds it. This limestone cannot be later than Eocene, and may be older. It is the only stone I have seen in the Pliocene territory of Texas, and some day it will be very valuable for quicklime.

"Above the Eocene, the Cretaceous formation rises like a rampart and extends north and west a great distance—how far it is not certainly known. Many say that it goes on northward, with occasional interruptions, until it reaches the plateau of the Rocky Mountains, including the Staked Plains. This is the idea of Professor Buckley. With all deference, I believe it is not so. I believe there is very little Cretaceous after reaching the great outburst of Plutonic and Metamorphic rocks which extend through Burnet, Llano, Mason and Menard counties, and farther west to an unknown distance. After passing this primitive region, the country assumes outlines totally unlike the Cretaceous as elsewhere seen. I have no doubt, indeed I know, that it appears here and there even to El Paso, on the Rio Grande, but the general formation I believe to be Jurassic, including the Staked Plains, and have little doubt that investigation will prove it to be so.

"Just north of the primitive region of Llano, etc., there is a large development of Carboniferous, extending northeast toward the Indian Territory, and embracing, as is calculated, 30,000 square miles of coal-bearing strata. It is no doubt a continuation of the Arkansas or Ozark system. The Permian formation here and there crosses this coal territory, and probably flanks it all round. The Permian is also undoubtedly developed largely farther north and west. Not far from Fort Concho it terminates, and here, closely connected with it, there is a narrow streak of coal strata, in which an excellent coal has been found. As in England, so in Texas, this formation, wherever found, seems to indicate unerringly the near presence of coal. I believe the Permian may be found almost anywhere near the foot of the Staked Plains.

"Beyond the Pecos, in that almost unknown region below the

El Paso stage route, it is difficult to say what is the ruling geological formation. All the formations, except the Tertiary, seem to have been thrown together in one vast pile of ruin, penetrated by valleys of exquisite beauty and fertility. Here we find all manner of Plutonic eruptions, frequently capped and flanked by Jurassic and Cretaceous rocks. Perhaps basaltic rocks predominate. They certainly assume some very immense forms, sometimes rising into perpendicular cliffs many miles long and a thousand or more feet high. The Permian also appears here, filled with selenite and other forms of gypsum. This is the most interesting region in the world to the geologist.

“Minerals.”—If we are filled with doubt in regard to the geological formations of Texas, we are much more so in regard to the minerals that lie hidden in her strata. As regards the Tertiaries, they contain many valuable deposits of iron ore in Eastern Texas, some of which have been a little worked and found to yield from forty to sixty per cent. of metallic iron. These ores are the brown oxides or limonite. The forests are dense in this region, and charcoal is obtainable at a nominal price. Limestones are usually within easy distance, sufficient to supply fluxes. These ores are also abundant in Robertson, Limestone and other counties of Central Texas, but have received no attention. The Eocene also contains very large deposits of lignite, some of which, particularly that found in Limestone county, is a superior variety of that sort of coal. It would prove excellent for gas-making, but will not coke. It burns furiously in a grate, but emits an unpleasant odor in combustion, which goes through the whole house and may even be smelled at a distance outside. Some of these layers of lignite are said to be at least twelve feet thick. They are associated with brown and blue shales, and rather soft brown sand-stone. There is some gypsum in the Eocene—notably about the falls of the Brazos, in Falls county, where it is in considerable quantity. It is pure enough for manufacturing into plaster of Paris, and there is none better for fertilizing. West of Corpus Christi large deposits of salt are formed annually in the lagoons near the gulf. In the winter these basins are filled with water from the gulf, which evaporates in

summer, leaving the clean white salt. Enough of it is thus formed here every year to salt all Texas. During the war these deposits supplied a large portion of Texas with salt.

"The Cretaceous contains a good deal of gypsum, and limestone for building or quicklime, without end. About two miles from Round Rock, on the International railroad, there is a great quantity of gypsum, quite pure. There is also a good deal of it about Mount Bonnel, near Austin. Both of these points are so convenient to transportation that it is singular that some one has not engaged in making plaster of Paris. Nearly all that article used in Texas comes from Newfoundland, and this when we have it just as good and in great abundance right at our own doors. No chalk has ever been found in the Cretaceous system of Texas, so far as I know.

"The granitic and metamorphic region, running through Burnet, Llano, Mason, Menard, etc., abounds in mineral wealth. There are probably no larger and certainly no better deposits of iron ore in the world than those of Llano county; none easier to get at. These ores are magnetic and specular, and often appear in immense masses resembling solid iron. They have been wrought to a very small extent and found to yield from seventy to eighty per cent. of iron, equal to the best in the world. With such immense masses of iron as this, Texas ought to furnish not only her own railroad iron, but also ship it to other lands. This will be done in time. At present Austin is the nearest point to a railroad, about a hundred miles off. The region is generally timbered, furnishing plenty of material for charcoal; some coal has also been discovered in this region, and it is known to exist abundantly in Coleman and other counties not far off. There is also abundance of limestone. Soapstone, valuable for furnaces, also abounds. Some copper, silver, and even gold, have been found in this region, but not yet, I believe, in paying quantities. Its great mineral wealth is doubtless its iron. Marble of excellent quality is found in places throughout this region. Perhaps the largest deposit of it is at the Marble Falls of the Colorado, where the river for a considerable distance cuts its way through walls and mountains of solid marble. It is not uncommon in this

region to find the people living in huts or cabins surrounded with fences built of the finest marble. The marble is of various shades—some pure white, some variegated with red and blue markings, and some black. This place is about sixty miles above Austin, and the marble might be brought down the river in flat-boats, but it is not.

“In the same region there are numerous salines, issuing, it is said, from Silurian rocks, and some salt of a very fine quality is manufactured—enough to supply the wants of the people around there. This whole region is very picturesque, and has some of the loveliest scenery on the American continent.

“Below this primitive region, lying out in the post-oaks to the southeast, are numerous strange boulders, which have been borne many miles from their native beds by some remarkable occurrence which took place about the close of the Cretaceous era. Some of these lost rocks are many tons in weight. The Jurassic and Permian beds are known to contain great deposits of copper, gypsum and salt. Indeed, the largest deposit of gypsum known in the world is found in Northwest Texas along Red river, and extending a great distance into the State. The gypsum belt is a hundred or more miles in width, and of unknown thickness. The gypsum is of all sorts, from the purest alabaster and selenite to the common massive forms. There is enough of it to supply the demands of the universe for centuries. All the streams that wander through this great bed are impregnated with this mineral and salt—some to such a degree that even the animals will not drink them. The Pecos is a strange compound, and one of the arms of the Brazos is far more briny than the ocean. Yet in all this region there are springs and deep circular pits of pure water. The Permian, in Archer and several other counties, is heavily stored with copper.

“In regard to the region west of the Pecos, I have this prophecy to place on record—that the day will come when it will develop great mineral wealth. We have every reason to think so. No intelligent man has ever penetrated that region without being filled with this conviction, and the more intelligent and observing he is the stronger is this conviction upon him. There is hardly

a doubt that the geological formation there is but a continuation of the rich mineral-bearing system of Colorado, Nevada and Chihuahua. The rocks appear the same; they contain silver, copper and lead. These rich metalliferous rocks run in great systems, and not in isolated protrusions. Thus we find gold in the great Appalachian system of mountains, reaching out thousands of miles; and thus we find gold and silver in the great Rocky and Andes Range, traversing the length of two continents. For this reason I have ever entertained a lively hope that much silver and gold will be found in the far isolated group of Llano, etc. The mountains beyond the Pecos fill every condition for the expectation of great mineral wealth. Here the systems of Colorado and the Sierra Rica, of Mexico, meet and blend. Being so rich elsewhere, why should they not be even richer where they meet and blend? I have no question that they will eventually prove so, and that those now utterly lonely mountains will be filled with great works and the busy camps of the miners. Silver will be the principal metal, though copper and lead will abound."

Forests and Vegetation.—Eastern Texas, east of the Trinity river, is a region of abundant timber, and although the most densely populated portion of the State, full one-half of its surface is still covered with forests. There are two species of pine, here known as the "long straw" and "short straw" pine, both of large size and producing excellent lumber, while the long straw yields a superior quality of turpentine. There are also in Eastern Texas several species of oak, including the live-oak, so called, an evergreen oak which differs somewhat from the live-oak of Florida, and which is found all over the State; the post-oak and blackjack; the ash, elm, black walnut, butternut, pecan, box-elder and pride of China; and toward the coast, the magnolia (here a stately tree), the cypress, palmetto, etc. In Northern Texas there are two immense belts of woodland, extending from the Red river southward, called the "Lower" and "Upper Cross Timbers." They are each about forty or forty-five miles wide, and extend southward from 150 to 200 miles; the first commences in Cooke and Grayson counties, along the Red river, and extends to McLennan county; the second, which is smaller,

occupies parts of Wise, Jack, Palo Pinto, Hood and Erath counties. Most of the trees in these forests are post-oak and black-jack oak, and they stand so wide apart that a wagon can be driven between them in any direction.

Central Texas is mainly rolling prairie; but with plenty of timber, generally of good quality, though sometimes cottonwood, buckeye, black gum or sweet gum, in the river and creek bottoms. There are also islands of forest trees, live-oak, cypress (which grows on the hills here), post-oak and mesquite scattered through the prairies. The coast belt has no forest trees, but frequent chapparals, composed mainly of the different species of cactus. This region has also in spring and early summer rich and nutritious grasses, and a profusion of brilliant flowering plants. Western and Northwestern Texas are scantily wooded, though even there the cypress, the live-oak (more rarely), and that wonderful tree, the mesquite, are found. The Osage orange (*bois d'arc*) and the pecan tree are among the other valuable forest trees of Texas. The *bois d'arc* grows in almost all soils; its wood is very hard and durable, and its thorns and rapid growth make it excellent for hedges.

The other shrubs and plants most common in Northwestern Texas and in the Llano Estacado are the yucca and four or five genera of the cactus, among which are the prickly pear, the melocactus, the mammelaria and several species of *cereus*. The sage brush is not so abundant, even on the Llano, as in New Mexico and Colorado. The mesquite grass, a very great favorite with cattle, is the best of the pasturage grasses of this region.

Zoölogy.—There are still some herds of buffalo and antelope in the northwestern part of the State, though the number is diminishing every year. In Western Texas the mustang or wild horse of Mexico still feeds in large troops on the prairies; the gray wolf, more ferocious and stronger than his northern congener, the black bear, the puma or cougar, the jaguar or American tiger, the wild cat and the lynx, are found in the wooded and thinly inhabited districts; while deer, peccaries, raccoons, opossums, foxes, hares and squirrels abound in the woods.

Among the feathered tribes are found: of game birds, the wild

turkey, pheasant, quail, snipe, curlew, many species of wild ducks, brant and teal, wild geese, swans, and a great variety of birds remarkable for sweetness of song or beauty of plumage; and among the birds of prey, the king vulture, or king of the buzzards, the common turkey buzzard, and other vultures, eagles, hawks, kites, pelicans, herons, king-fishers, flamingoes, cranes, etc. The streams abound in fish, of which the black bass and the war-mouth perch are the best edible fresh-water varieties, while the waters of the bays and gulf yield immense numbers of the salt-water fish common to all the Atlantic and gulf coasts. The oysters of Galveston bay and its vicinity are considered good by epicures. Alligators, turtles, etc., are abundant in the lower portion of the rivers and bayous, and on the coast are seen, though less frequently, the great sea-turtles, the manatee, octopus and the porpoise. In the mountains and wooded districts, rattlesnakes, moccasin snakes, copperheads, the red-mouthed adder and the milk adder are sufficiently numerous, and several species of the black snake (our American boa) and great numbers of harmless snakes are found almost everywhere. The gecko and other lizards, among them the chameleon, horned toads, horned frogs, salamanders, etc., abound, and the insect tribes are both numerous and formidable. The centipede, and on the lower coast a small sand scorpion, the large jumping spider, horse flies, buffalo gnats, chigoes and mosquitoes are all more or less troublesome; but they are not found in the same localities nor at the same season of the year. The insects injurious to vegetation are less numerous and destructive than in any other States.

Climate.—The climate of Texas is varied from semi-tropical to moderately temperate. Snow and ice are seldom seen in the central portion, and rarely, if ever, in the extreme south. In the northern part one or two snow-falls during the winter, of from one to three inches in depth, are usually expected. Occasionally a much heavier fall is had, and ice from one to two inches in thickness is sometimes made.

In the northeastern and eastern sections of the State the mercury in summer rarely rises above 100, and as rarely descends to zero. The summers are long and the heat continuous, but

not as intense as in many localities farther north. The winters are generally mild and for the most part pleasant. On the coast, even at Brownsville, near the mouth of the Rio Grande, the mercury rarely or never reaches 100° , and as rarely falls below 32° in winter. The entire range of the year is not over 66° .

Along the whole course of the Rio Grande, and, indeed, generally in Western and Northwestern Texas, the climate is entirely different, bearing a greater resemblance to that of Arizona and New Mexico. The summer temperature rises to 110° , 112° or 116° , and what is remarkable attains its greatest intensity in May, when it remains above 100° for fifteen or twenty days together. In winter it falls to about 20° or 25° , the annual range being from 91° to 96° . The rainfall varies as much as the temperature. In Galveston it averages more than 50 inches; in Austin, 34.55; in Denison, about 31 inches; while west of the 100th meridian it gradually diminishes from 21.21 at Brackettsville to 8.99 at El Paso. From the reports of twenty-five stations of the Signal Service Office in Texas, and reports from two or three others from private sources, we have selected eight points, of which we give temperature, rainfall, and, in two of them, the barometer. These eight points represent as fairly as possible the meteorology of all parts of the State.

Mining and Manufacturing Industries.—There can be no question that Texas possesses a vast amount of mineral wealth, and that at some not distant day the mountain districts of Western and Northwestern Texas will be thoroughly prospected, and hundreds of mines of gold, silver and copper opened and profitably worked. The mines of coal, of rock salt and of lead, which are now just developing, will be wrought on an extensive scale, and the soapstone, marble, slate and gypsum will be largely exported. The whole State west of the meridian of San Antonio is full of mineral wealth. But at present there is a lack of the enterprise which is necessary for the development of these treasures.

Historical Data.—The following memoranda of dates and events in Texan history are from a "Chronological Compend

of Texas History," prepared for "Burke's Texas Almanac for 1880," by D. W. C. Baker. They have been carefully verified by us:

"Texas is supposed to have its name from an Indian village called Texas on the Neches river. Its meaning in the Indian language is *friend*.

"In 1685 a French cavalier named Robert de La Salle, with a small colony, landed at Matagorda bay and built a fortress, which he called in honor of the King of France, St. Louis. This colony was soon exterminated by disease and the hostility of the Indians; and La Salle was killed by one of his own mutinous followers.

"Spain next attempted the occupation of Texas, and in 1689 a colony was landed and a mission was built near the spot where four years previously La Salle had landed. This colony was soon broken up by the same causes as the former one.

"Between the years 1690 and 1720 the Spanish Roman Catholics established many missions and fortresses within the borders of Texas. Three missions were built and occupied by monks and friars, and by soldiers who were sent to defend them.

"After many vicissitudes the Spanish missions were within a century from their establishment one after another abandoned, leaving throughout the State crumbling ruins of massive buildings, which to this day sufficiently attest the self-sacrificing devotion and labors of those Christian ambassadors from the Old World.

"The fate of the inmates of the mission of San Saba was one of the most deplorable recorded in history. This mission was established in 1734, and for a while the Indians proved friendly. In 1752 a silver mine was discovered there, which drew to the place a number of adventurers. Trouble soon arose between these and the savages, who in their rage made an onslaught on the fortress, and slew all who were there, not one escaping.

"Thus the efforts of France and Spain to effect a permanent occupation of Texas failed.

"France formally abandoned her claims in 1763, and in 1821 Mexico threw off the Spanish yoke, and Spain thereafter ceased

to press her claims for it. Texas thus became a province of Mexico in 1821. At that time, despite the blood and treasure which had been expended by the governments of the old world to hold Texas, nothing had been accomplished. It was practically as much a wilderness in 1821 as when La Salle set foot upon its shores in 1685, the white population being only 3,000 in the whole Territory.

"But the time had now come when the Anglo-American turned his steps hither, and history has yet to record where he has ever failed of his undertaking. The permanent colonization of Texas by citizens of the United States began in 1821.

"In 1821-22 Stephen F. Austin, to whom justly belongs the title, Father of Texas, introduced a large number of colonists, and furnished them homes. After devoting the best years of his life to the accomplishment of his darling enterprise of establishing permanent and prosperous colonies in Texas; after undergoing hardships and braving dangers such as few men have ever experienced, he was stricken down with disease at Columbia, Brazoria county, and there died, December 25th, 1836, in the forty-fifth year of his age. From the advent of Austin until 1830 the American population of Texas continued rapidly to increase, and at that time numbered about 20,000.

"Then the government of Mexico became alarmed at the rapidly increasing strength and influence of the young colony, and took steps to prevent its further growth. The Dictator of Mexico, Bustamente, issued a decree suspending all existing colony contracts, and forbidding under severe penalty any citizen of the United States from settling in Texas. This measure did not have the desired effect, and the tide of immigration continued to pour into the country.

"In 1833 the citizens of Texas, in the proper exercise of their rights as freemen, called a council at San Felipe. Of this council W. H. Wharton was president. A memorial and petition was prepared, setting forth in calm and forcible language the wants and grievances of the colonists, and praying the central power at Mexico for a separate State organization. This memorial was sent to Mexico by the hands of Stephen F. Austin. No definite

response was given to this petition, and Austin was thrown into prison, where he remained many months. Thus matters remained until 1835, when the colonists becoming fully satisfied that prompt action could alone protect their interests, held primary meetings and took steps to secure a separate government. Santa Anna, the Dictator, at once sent large bodies of soldiers to quell the revolutionary spirit which now showed itself.

"On the 2d of October the opening battle of the Texas revolution was fought at Gonzales.

"On the 8th day of October, 1835, a force of Texans under Captain Collingsworth, attacked and captured the fort at Goliad. On the morning of the 28th of October a detachment of Texans under Captains Fannin and Bowie, who were encamped on the bank of the San Antonio river near the Mission of Conception, was surrounded and attacked by a large body of Mexicans. A short but decisive action followed, in which the Mexicans were completely routed, and fled, leaving one hundred dead upon the field.

"On the 3d day of November, 1835, a general consultation, consisting of delegates of the colonists, assembled at San Felipe for the purpose of establishing a provisional government. This consultation elected Henry Smith Provisional Governor of Texas, and adopted a declaration setting forth that Texas no longer owed allegiance to the nominal Mexican Republic.

"On the 26th day of November, 1835, a skirmish took place near San Antonio, called the *grass fight*, in which the Mexicans were driven to their entrenchments with a loss of fifty men.

"On the 5th day of December, 1835, the forces of the colonists in two divisions, under command of Col. J. W. Johnson and Col. Benj. R. Milam, made a series of determined assaults upon the city of San Antonio, which was occupied by a large force of the enemy. After a number of sanguinary battles, in which great valor was displayed on both sides, the Texan forces obtained complete possession of the city on the 10th of December, and General Cos, with eleven hundred soldiers surrendered. In this affair the heroic Milam was slain. This decisive conquest had the effect of exciting much enthusiasm among the colonists.

"Santa Anna now determined to crush out the rebellion in Texas by one decisive campaign, and in January, 1836, he equipped an army of 7,500 picked men, and placing himself at their head he marched into Texas.

"The fortress of the Alamo was then garrisoned by a force of 170 men, commanded by Col. W. B. Travis. They were soon surrounded by the whole Mexican army and summoned to surrender. This being refused, a furious bombardment was commenced, which was continued from the 25th of February until the 6th day of March, 1836. On the morning of the last named day the besiegers made a desperate assault upon the garrison. The particulars of that struggle can never be known. Enough to say the heroic band, exhausted by incessant toil, watchfulness and privation, were at length destroyed. Of the whole number within the walls of the fort only two escaped, a woman and a child. This victory cost Santa Anna 1,500 of his best soldiers. Close upon the heels of the dreadful massacre at the Alamo came another equally appalling.

"Col. J. W. Fannin, who was stationed at Goliad with a garrison of 500 men, was, on the 19th day of March, 1836, surrounded by a vastly superior force of the enemy. Notwithstanding the Texans were almost entirely destitute of supplies and ammunition, a desperate battle was fought, in which after inflicting a loss of 300 men upon the enemy, Col. Fannin was compelled to surrender, on promise of honorable treatment. The forces thus capitulated were, in violation of the terms of surrender, marched out and inhumanly shot on the 27th day of March, 1836.

"General Sam Houston, who had been appointed Commander-in-Chief of the Texan army, now fell back before the invader, in order to draw him as far as possible from his base of supplies, as well as to recruit his little army. He continued his retreat until, on the 20th day of April, he formed his troops in line of battle on the banks of the San Jacinto river.

"The Mexican commander eagerly followed, and on the 21st day of April, 1836, was fought the memorable battle of San Jacinto. This decisive encounter resulted in the total rout of the Mexican army and the capture of Santa Anna, and secured the independence of Texas.

"On the 2d day of March, 1836, a convention of the people of Texas at Washington, on the Brazos, adopted a declaration of independence and established a government *ad interim*, by electing David G. Burnet President.

"The population of Texas now increased rapidly.

"The first newspaper in Texas was established in San Felipe in October, 1835, by Joseph Baker and Gail and Thomas H. Borden.

"September, 1836. General Sam Houston and M. B. Lamar elected first constitutional President and Vice-President of the Republic.

"October, 1836. First Congress met at Columbia. By this body wise laws were enacted, an able judiciary established, the army organized, and the people put in possession of their civil and political rights.

"March, 1839. The Congress of the United States acknowledged the independence of Texas.

"October, 1839. Seat of government established at the new city of Austin. It had previously been first at San Felipe, next at Washington, next at Harrisburg, next at Galveston, next at Velasco, next at Columbia, next at Houston. In 1842 a Mexican invasion into Western Texas induced General Houston to order the removal of the government offices to Houston, where they remained until November of that year, when the seat of government was removed to Washington. In 1850, and again in 1870, elections were held by which the capital of Texas was permanently fixed at Austin, where it now is.

"In September, 1838, M. B. Lamar and David G. Burnet were elected President and Vice-President. In 1837, the independence of Texas was acknowledged by France, and in 1840 by England, Holland and Belgium. September, 1841, General Houston and Edward Burleson were elected President and Vice-President. September, 1844, Anson Jones was elected President, and K. L. Anderson, Vice-President.

"In February, 1845, Texas was annexed to the United States.

"July, 1845, first State Convention met at Austin.

"November, 1845, Constitution adopted.

"From 1853 to 1856, public buildings were erected at Austin, the debt of the Republic cancelled, the Asylum founded, criminal code adopted, permanent school fund set apart, and aid given to railroads.

"In 1859, General Sam Houston and Edward Clark were elected Governor and Lieutenant-Governor.

"February, 1861, the ordinance of secession was passed by Texas Convention.

"March 18th, 1861, General Houston retired from office to his home in Huntsville, where he died, July, 1863.

"August, 1861, F. R. Lubbock and John M. Crockett were elected Governor and Lieutenant-Governor.

"October, 1862, Galveston captured by Federal troops.

"January, 1863, Galveston retaken by Confederate forces.

"August, 1863, Pendleton Murrah and F. S. Stockdale were elected Governor and Lieutenant-Governor.

"In 1865, A. J. Hamilton was appointed by the President, provisional Governor of Texas.

"June 19th, 1865, General Granger issued a general order proclaiming freedom of slaves in Texas.

"February 10th, 1866, first reconstruction convention assembled at Austin, and framed constitution.

"July, 1866, J. W. Throckmorton and G. W. Jones were elected Governor and Lieutenant-Governor.

"March, 1867, Texas again under military rule.

"August, 1867, E. M. Pease appointed provisional Governor.

"June, 1868, second reconstruction convention met at Austin and framed constitution.

"November, 1869, E. J. Davis and J. W. Flannagan were elected Governor and Lieutenant-Governor.

"In 1870, Senators and Representatives from Texas again admitted into Congress.

"December, 1873, Richard Coke and R. B. Hubbard were elected Governor and Lieutenant-Governor of Texas, and they were re-elected to these positions in February, 1876.

"The present State Constitution was framed by a Convention which assembled at Austin, September 6th, 1875. Governor Coke,

having been elected United States Senator, resigned the office of Governor, and R. B. Hubbard became Governor of Texas, December 1st, 1876.

"November, 1878, O. M. Roberts and J. D. Sayers were elected Governor and Lieutenant-Governor, which positions they now hold.

"At the first election for President of Texas in 1836 the whole vote cast was only 5,704; in 1838 the vote was 7,247; in 1840 it was 11,531; in 1844 it was 12,752; in 1845 the vote for Governor was only 9,578, because many neglected to attend the polls; in 1847 it was 14,476; in 1849 it was 21,715; in 1851 it was 28,309; in 1853 it was 36,152; in 1855 it was 45,339; in 1857 it was 56,180; in 1859 it was 64,627; in 1861 it dropped to 57,443 on account of the neglect of people to vote, while in 1863, when most of the voters were in the Confederate army, it was only 31,037. In 1866 it rose to 60,682; in 1869 it was 79,373; in 1873 it was 128,361; in 1876 it was 198,137; in 1878 it was 236,917; in 1880 the vote for President was 237,337."

Conclusion.—Land is so cheap in Texas, and some of it so good, the facilities for stock-raising, as well as for farming, are so desirable, the climate so mild and healthful, and the greater part of the State is now, or soon will be, so accessible by steamers and railroads, that it presents great advantages to immigrants.

CHAPTER XIX.

UTAH TERRITORY.

UTAH is a peculiar Territory; peculiar in its situation, half in the Great Salt Lake basin, and half in the equally wild and deeply grooved basin of the Colorado river; singular in its geology, its minerals, its salt and fresh water lakes and rivers, with no outlet beyond its walls of rock; peculiar in its deposits of the precious metals and coal; peculiar in its deserts, and still more peculiar in the character, religious, political, and social, of the majority of its inhabitants.

It is one of the central Territories of the middle belt of States

and Territories of "Our Western Empire." It is bounded wholly by mathematico-geographical lines, lying between the parallels of 37° and 42° north latitude, and 109° and 114° west longitude from Greenwich. Its northern boundaries are Idaho and Wyoming; its eastern, Wyoming and Colorado; its southern, Arizona, and its western, Nevada. It is not quite a square, a tract which extends from the 41st to the 42d parallel and from the 111th to the 114th meridian being added to it on the north to include Great Salt lake, Bear lake, etc., and to make a part of its northern boundary coterminous with that of Idaho and Nevada. It has a maximum length of 325 miles by a breadth of 300; area 84,476 square miles, or 54,064,640 acres.

Forests and Vegetation.—On the mountains and along the water-courses are found the following trees, shrubs and vines, to wit: cottonwood, dwarf birch, willow, quaking aspen, mountain maple, box-elder, scrub cedar, scrub oak, mountain oak, white, red, yellow and piñon pine, white spruce, balsam-fir, mountain mahogany, common elder, dwarf hawthorn, sumac, wild hop, wild rose, dwarf sunflower, and of edible berries, service berry, bullberry, wild cherry, wild currant, etc. Most of the plants belong to the *compositæ*, *cruciferae*, *leguminosæ*, *boraginaceæ*, or *rosaceæ*.

Altitude of Mountains and Valleys.—It is intersected from north to south by the Wahsatch mountains, dividing it nearly equally between the Great Basin and the basin of the Rio Colorado. The altitude of the surface on both sides of this mountain range is about the same, the valleys 4,000 to 6,000 feet above sea-level; the mountains, 6,000 to 13,000. West of the Wahsatch, the drainage is into lakes and sinks which have no outlet, the largest of which is Great Salt lake, with an elevation of 4,260 feet, a shore line of 350 miles, and an area of 3,000 to 4,000 square miles. It receives the Bear and Weber, and many smaller streams, and, also, the discharge from Utah lake through the River Jordan. The latter is fresh water, about ten by thirty miles in extent, the receptacle of American, Provo, and Spanish rivers. There are numerous valleys, the lowest of them higher than the average summit of the Alleghanies. Following

are the ascertained altitudes of representative lakes, rivers, springs, valleys, and towns, namely:

Great Salt Lake.....	4,260	Skull Valley,	Tooele County.....	4,850
Utah Lake.....	4,500	Deep Creek,	Tooele County. . .	5,230
Sevier Lake.....	4,600	Nephi,	Juab County.....	4,927
Little Salt Lake, Paragoonah.....	6,220	Fillmore,	Millard County.....	6,024
Bear Lake, Laketown.....	6,000	Antelope Springs,	Millard County.....	5,850
Bear River, Randolph.....	6,440	Beaver,	Beaver County.....	6,050
Bear River, Hampton's Bridge...	4,540	Fort Cameron,	Beaver County.....	6,100
Weber River, Kamas.....	6,300	Wah Wah Springs,	Beaver County.....	5,450
Weber River, Ogden.....	4,300	Buckhorn Springs,	Iron County.....	5,690
Provo River, Heber.....	5,574	Desert Springs,	Iron County.....	5,880
Provo River, Provo.....	4,520	Iron City,	Iron County.....	6,100
San Pitch River, Mt. Pleasant.....	6,090	Cedar City,	Iron County.....	5,726
San Pitch River, Gunnison.....	5,144	St. George,	Washington County.	2,900
Sevier River, Panguitch.....	6,270	Diamond,	Tintic Mines.....	6,370
Sevier River, Bridge.....	4,765	Strawberry Valley,	Wahsatch County..	7,716
Cache Valley, Logan.....	4,550	Rabbit Valley,	Sevier County.....	6,820
Salt Lake City, Signal Office.....	4,350	Kanab,	Kane County.	4,900
Fort Douglas, Near Salt Lake City.	4,800	Paria,	Kane County.....	4,562
Bush Valley, Tooele County.....	5,200	Kanarra,	Rim of Basin.....	5,420

Zoölogy.—Among the animals are the coyote, gray wolf, wol-verine, mountain sheep, buffalo (now extinct in Utah), antelope, elk, moose; black-tailed, white-tailed, and mule deer; grizzly, black, and cinnamon bear; civet cat, striped squirrel, gopher, prairie-dog, beaver, porcupine, badger, skunk, wild cat, lynx, sage and jack-rabbit and cottontail. Birds: golden and bald eagle and osprey; horned, screech and burrowing owl; duck; pig-geon; sparrow, sharp shinned and gos-hawk: woodpecker, raven, yellow-billed magpie, jay, blackbird, ground robin, song sparrow; purple, grass and Gambell's finch; fly-catcher, wren, water ouzel, sky lark, English snipe, winter yellow-legs, spotted sand piper, great blue heron, bittern, stork, swan, pelican, Peale's egret, ground dove, red shafted flicker, mallard and green-winged teal, goose, ptarmigan, humming bird, mountain quail, sage cock and pine hen. Reptiles: Rattle-snake, water-snake, harlequin-snake, and lizards. The tarantula and scorpion are found, but are not common.

Geology.—The greater part of the rock of the interior moun-tain area is a series of conformable stratified beds,* reaching

* Clarence King's Explanations 40th parallel.

from the early Azoic to the late Jurassic. In the latter these beds were raised, and the Sierras, the Wahsatch, and the parallel ranges of the Great Basin were the consequence. In this upheaval important masses of granite broke through, accompanied by quartz, porphyries, felsite rocks, and notably sienitic granite, with some granulite and gretsen occasionally. Then, the Pacific Ocean on the west, and the ocean that filled the Mississippi Basin on the east, laid down a system of Cretaceous and Tertiary strata. These outlying shore beds, subsequently to the Miocene, were themselves raised and folded, forming the Pacific Coast Range and the chains east of the Wahsatch; volcanic rocks accompanying this upheaval as granite did the former one. Still later a final series of disturbances occurred, but these last had but small connection with the region under consideration.

There is a general parallelism of the mountain chains, and all the structural features of local geology, the ranges, strike of great areas of upturned strata, larger outbursts of gigantic rocks, etc., are nearly parallel with the meridian. So the precious metals arrange themselves in parallel longitudinal zones. There is a zone of quicksilver, tin, and chromic iron on the coast ranges; one of copper along the foot-hills of the Sierras; one of gold farther up the Sierras, the gold veins and resultant placers extending far into Alaska; one of silver, with comparatively little base metal, along the east base of the Sierras, stretching into Mexico; silver mines with complicated associations through Middle Mexico, Arizona, Middle Nevada, and Central Idaho; argentiferous galena through New Mexico, Utah, and Western Montana; and, still farther east, a continuous chain of gold deposits in New Mexico, Colorado, Wyoming and Montana. The Jurassic disturbances in all probability are the dating point of a large class of lodes: *a*, those wholly enclosed in the granites, and *b*, those in metamorphic beds of the series extending from the Azoic to the Jurassic. To this period may be referred the gold veins of California, those of the Humboldt mines, and those of White Pine, all of class *b*; and the Reese river veins, partly *a*, and partly *b*. The Colorado lodes are somewhat unique, and in general belong to the ancient type. To the Tertiary period

may be definitely assigned the mineral veins traversing the early volcanic rock ; as the Comstock Lode and veins of the Owyhee District, Idaho. By far the greater number of metalliferous lodes occur in the stratified metamorphic rocks or the ancient eruptive rocks of the Jurassic upheaval ; yet very important, and, perhaps, more wonderfully productive, have been those silver lodes which lie wholly in the recent volcanic formations.

Mineralogy.—Utah is probably the richest Territory in "Our Western Empire" in its deposits of gold and silver, though Arizona, Colorado, Montana, Nevada and California might be inclined to dispute the justice of her claim. The region south of Great Salt Lake, between the Jordan river and the Oquirrh Mountains, and the whole of the Oquirrh range on both sides, is full of gold and silver veins. Next south of these comes the Tintic Silver district, and as we proceed south, still in the Great Salt Lake Basin, the whole region from Sevier lake to the Arizona line abounds in lodes of silver, gold and copper, with occasional beds of coal, iron and alum. On the western slope of the Wahsatch Mountains, which forms the eastern wall of the basin, there are numerous silver mines, and they extend also east of the Wahsatch, especially along the line of the Uintah Mountains. But those counties in the Colorado Basin are especially rich in coal, much of it adapted to smelting purposes. There are twelve counties in which extensive coal lands have been found. The iron deposits of all varieties are of enormous extent in every part of the Territory. Utah could produce all the iron and steel needed in the United States more cheaply than any other section. Sulphur exists in immense beds. Salt abounds everywhere. Other minerals are copper, lead, manganese, antimony, chrome, red and white ochre, jet, asphalt, mineral wax and mineral waters. The mines of antimony in Southern Utah are said by Professor Newberry to be richer and more easily worked than any other in America.

Topography, General Features.—The settled part of Utah lies along the western base of the Wahsatch Mountains, which run through the heart of the Territory from north to south, reaching their greatest altitude near Salt Lake City (where they abut on

the Uintah Range coming from the east, forming the cross-bar of a T), and almost losing themselves in the sandstone plateau of the Rio Colorado in the south. Abreast of Salt Lake City the Wahsatch Range is 10,000 to 12,000 feet in altitude. Here, within a small area, rise the Bear and Weber rivers, which empty into Salt lake; the Provo, which empties into Utah lake; and some of the main affluents of the Green river, which, with the Grand, become the Rio Colorado, lower down. It is in the vicinity of the heads of these rivers that the Emma, the Flagstaff, the Vallejo, the Ontario, McHenry and various other well-known mines are situated. Nearly one-half of the Territory lies south of the Uintah Range, and east of the Wahsatch Range proper, and is drained by the Green and Colorado rivers and their tributaries. Its general altitude along these streams is between 4,000 and 5,000 feet; it is much broken by mountains, and is but partially explored and not settled at all. It contains many thousand square miles of fine grazing country, above the Grand cañon, with more or less arable land, and no one yet knows what mineral treasures. It is believed that the Denver and Rio Grande Railroad, after being drawn to the head of the Arkansas river by the mineral attractions of Leadville, will find an easy way through this region, entering the Great Basin via some of the feasible railroad passes of the Wahsatch. A wide strip of the western part of the Territory is lake, sink, mountain or desert. The inhabited part is chiefly a narrow belt, watered by the streams of the western slope of the Wahsatch Range, which lose themselves in inland lakes or basins. The largest and best known of these is the Great Salt Lake Basin.

Great Salt Lake Basin.—Including the valley of Bear river up to the Gates on the north, the Utah Basin, on the south, whose waters are discharged into Great Salt lake, through Jordan river, it is 200 miles in length by forty or fifty in width. The principal streams which are lost in Great Salt lake are the Malad and Bear, the latter 300 miles long, on the north; Box Elder and Willow creeks, Ogden and Weber rivers on the east; and City, Mill and the Cottonwood creeks and the river Jordan on the south. Into Utah lake flow the American, Provo and Spanish

forks, though they are not forks but independent mountain streams, and Salt creek. All of them but the Malad have their sources in the Wahsatch Range, which collects the snows in winter that give them life and being. Where they emerge from their cañons, settlements have been made on them, and their waters appropriated, so far as it can be cheaply done, for the purposes of irrigation, and in some cases, of furnishing power for mills. Of these settlements, the largest is Salt Lake City, located about centrally as regards the length of the entire basin, at the base of the Wahsatch Range, ten or twelve miles from the southeast shore of Salt lake, containing a population, June, 1880, of 20,768. The city is supplied with water by City creek. It is laid out with broad streets and sidewalks, and is built up more or less for two miles square, shade and fruit trees largely hiding the buildings in the summer season. It has ample hotel accommodations, gas, water and street cars; is peaceful and orderly; is connected with the outside world and adjacent points of interest or business by rail. Enjoying the most healthy and agreeable climate of perhaps any large town in the United States, with street cars running to the famous Warm Springs, and the bathing shores of Salt lake but a half-hour's ride on the rail distant; with the peaks of the Wahsatch, the Oquirrh, and other ranges ruffling the clouds at every point of the horizon; with picturesque mountain cañons threaded by trout streams accessible by rail, it is one of the most attractive places of summer resort for tourists seeking health or pleasure in all the world. The eastern edge of Salt Lake Basin is dotted with settlements, and is highly cultivated wherever water can be got on the ground. There are the North String, Bear River City, Corinne, Brigham City, Willard, North Ogden, Ogden, Kaysville, Farmington, Centerville, Bountiful, Salt Lake City, the Cottonwoods, Sandy, West Jordan, Deweyville, Lehi, American Fork, Pleasant Grove, Provo, Springville, Spanish Fork, Salem, Payson, Santaquin, Mona, Nephi and Levan. Ogden, at the intersection of the east and west and north and south railroads, is the town next in importance to Salt Lake City, the capital. It is in the forks of Ogden and Weber rivers, is within a short drive of fine fishing and mountain scenery, and is

rapidly improving. The Salt Lake Basin at large has an altitude of about 4,500 feet above the sea, and is the paradise of the farmer, the horticulturist, and the grower of fruit. Cut off from it by a low range, now surmounted by the Utah and Northern Railway, toward the northeast, is Cache Valley.

Cache, San Pete and Sevier Valleys.—Cache Valley is oval in shape, and perhaps ten by fifty miles in extent, watered by Logan and Blacksmith forks of Bear river, and by the latter itself, and sustaining a settlement wherever a stream breaks out of the enclosing mountains. Logan is the principal town of Cache Valley, and thence one drives eastward through Logan Cañon forty or fifty miles to Bear Lake Valley, Bear river here flowing toward the north. Farther on it bends to the west and southward, and down through Cache Valley, finds its way to Salt Lake. Cache and Bear Lake Valleys have a score of towns and 15,000 inhabitants. To the southeast of Salt Lake Basin, and to be connected with it by rail through Salt Creek or Nephi Cañon, this season, lies San Pete Valley, called the granary of Utah, surrounded by mountains, except on the south, where the San Pitch river breaks through into the Sevier, and sustaining eight thriving towns, all still in their infancy, though founded several years ago. San Pete and Cache Valleys are fine grain-growing sections, but having colder winters are not so well adapted to fruit-raising as the Salt Lake Basin. Next southward is the Sevier river, which has its source in Fish (Indian, Panguitch) lake, near the southern boundary of the Territory, and runs, like Bear river, a long way north before it finds a way out of the mountains, and turning to the southwest is finally lost in Sevier lake. Most of the streams in the southwest lose themselves in small lakes or sinks, that is, such as rise to the northward of the divide between the Great Basin and the Rio Colorado country. The Sevier River Valley is occupied, like all the other Utah valleys (and there are many in the recesses of the Wahsatch, and some outlying and disconnected with that range, although of minor importance, which have not been particularly noticed), where a stream breaks out of the adjoining mountains, by a settlement; but, like the other streams, the full capacity of the Sevier river for irrigation has not been called into requisition.

The western third of the Territory from end to end is an alternation of mountain, desert, sink and lake, with a few oases of arable or grazing lands. Great Salt lake covers an area of 3,000 to 4,000 square miles, and the desert west of it a still larger area. The Sevier, Preuss and Little Salt lakes, all together, are small, in comparison. Formerly a mighty river flowed northward from the vicinity of Sevier lake to the westward of Great Salt lake, the dry bed of which, nearly a mile in width, must be crossed in going west from Salt Lake City to Deep Creek. Since it dried up, hills and spurs of mountains have been upheaved in its course, but the old channel continues on its way up hill and down, and over them all. Divided off from Great Salt lake by a sort of causeway 800 feet high is Rush Valley, containing a lake covering twenty to thirty square miles, where twenty years ago there was hay land and a military reservation. This, as well as the accompanying filling up of Great Salt lake, shows a decided aqueous increase in Salt Lake Basin within that time. Rush Valley has mining and agricultural settlements, but much more pastoral than arable land; and so has Skull Valley, to the westward. But from these south to the rim of the Basin, there are only occasional habitable spots, and they are due to springs. The mountains are the source of the wealth of Utah, present and prospective, which consists in water and metals. They gather the snows in winter which feed the streams in summer. In the northern part of the Territory the Wahsatch Range attains generally a high altitude, with a mass in proportion. There is a large accumulation of snow in winter, and the streams are correspondingly large and numerous. In the southern part of the Territory the main range is lower and less massive; the average temperature is higher, of course; there is less snow, smaller and fewer streams, and more desert in proportion. This part of the Territory is not rich in agricultural resources. The isolated ranges in the Great Basin seldom give rise to streams of much magnitude, and the intervening valleys partake more of the desert character. But all the mountains, so far as known, are full of minerals, and there is generally water enough for the purposes of mining and reducing them.

The region east of the Wahsatch Mountains and south of the Uintah Range, is wholly in the Colorado Basin. It is not as yet settled to any considerable extent, but the deep cañons of the Grand, Green, San Juan and Rio Colorado, which traverse it, are full of wonders and terrors. There is every reason to believe that the mineral wealth of this region is fully equal to that of the Great Salt Lake Basin, and unless the lack of water shall prevent their successful working, the whole region will, a few years hence, be honeycombed with mines of gold and silver, lead, copper, iron and coal.

Climate.—The climate of a mountainous country like Utah will vary considerably with its varying altitudes and exposures. The inhabited parts of the Territory range, in general, between 4,300 and 6,300 feet above the sea; but seventy per cent. of the population is settled in valleys not exceeding 4,500 feet in elevation, and probably fifty per cent. in the basin of Great Salt lake. In these lower valleys the climate is mild and agreeable. Its perpetual charm cannot be conveyed by meteorological statistics. The atmosphere is dry, elastic, transparent and bracing; and the temperature, while ranging high in summer, and not altogether exempt from the fickleness characteristic of the climate of North America in general, compares favorably in respect of equability with that of the United States at large, and especially with that of Colorado and the Territories north and south of Utah. Its range upwards is less than that of St. Louis, Philadelphia and New York, to say nothing of that of Arizona; while in the other direction there is no comparison, either with the Eastern States, intersected by the same isothermal, or with Colorado, Idaho and Montana. This description applies mainly to Northern and Central Utah within the Great Salt Lake Basin. Outside that Basin, across the Wahsatch Mountains, and at an elevation not much greater, at Coalville, for example, not more than seven or eight miles farther north, and perhaps thirty-five miles east, the difference of climate is very marked. The annual mean temperature at Salt Lake City is $51^{\circ} 9'$; at Coalville, $48^{\circ} 65'$; the spring means at the two places are $51^{\circ} 7'$ and $45^{\circ} 9'$; the summer means $75^{\circ} 9'$ and $69^{\circ} 2'$; the autumn, $54^{\circ} 8'$ and $48^{\circ} 9'$; and the winter means, $32^{\circ} 1'$ and $21^{\circ} 9'$.

In Southern Utah, both within and without the Basin, the climate is much more tropical, approaching to that of Arizona.

Meteorology of Salt Lake City and Camp Douglas.

MONTHS.	1877.						
	TEMPERATURE.				HUMIDITY.		MEAN PRESSURE.
	Mean.	Max.	Min.	Rng.	Per Ct.	Rainfall Inches.	Barometer Inches.
	°	°	°	°			
January	27.9	50	3	47	74.9	.87	30.071
February	33.7	55	15	40	75.3	.38	30.076
March	48.0	73	28	45	52.9	2.93	29.894
April	48.6	70	30	40	48.6	2.14	29.834
May	56.7	83	34	49	42.1	3.49	29.791
June	65.9	90	43	47	29.7	.80	29.927
July	78.2	98	50	48	24.1	.02	29.919
August	76.3	96	53	43	25.1	.28	29.971
September	65.0	90	42	48	31.5	.90	29.937
October	51.0	80	25	55	41.0	2.41	29.971
November	40.1	60	15	45	55.4	1.02	30.078
December	31.7	51	8	43	68.1	1.11	30.039
For the Year	51.9	98	3	95	47.4	16.35	29.950

MONTHS.	1878.						
	TEMPERATURE.				HUMIDITY.		MEAN PRESSURE.
	Mean.	Max.	Min.	Rng.	Per Ct.	Rainfall Inches.	Barometer Inches.
	°	°	°	°			
January	30.0	52	5	47	64.8	1.07	30.035
February	32.8	60	20	40	66.2	3.49	29.882
March	46.6	73	27	46	52.6	2.54	29.926
April	49.8	73	30	43	43.4	2.63	29.817
May	56.2	83	34	49	39.0	2.50	29.882
June	69.4	93	45	48	30.7	.35	29.939
July	77.7	96	52	44	26.2	1.08	29.900
August	78.5	97	60	37	33.7	.81	29.956
September	60.5	92	38	54	37.0	3.15	29.975
October	48.5	78	22	56	44.5	1.39	30.055
November	42.7	68	22	46	54.6	.63	30.081
December	29.7	56	8	48	59.1	.11	30.091
For the Year	51.9	97	5	46	45.9	19.75	29.979

We have no meteorological statistics of any points in the Territory, except Salt Lake City and Camp Douglas, which is near it, but 500 feet higher. The above tables give the tempera-

ture, rainfall, humidity and mean barometrical pressure at Salt Lake, and such particulars as are at hand concerning Camp Douglas. The latitude of Salt Lake City is $41^{\circ} 10'$; the longitude, 112° ; the elevation, 4,362.25 feet.

The mean air pressure at Salt Lake City is 25.63 inches; water boils at 204.3° . The prevailing winds are from the north-northwest, and the most windy months are March, July, August and September. The mean velocity of the winds during the entire year is $5\frac{1}{2}$ miles an hour. On the ocean it is 18 miles; at Liverpool it is 13; at Toronto, 9; at Philadelphia, 11. The climate of Utah, on the whole, is not unlike that of Northwestern Texas and New Mexico, and is agreeable except for a month or so in winter, and then the temperature seldom falls to zero, or snow to a greater depth than a foot, and it soon melts away, although it sometimes affords a few days' sleighing. The spring opens about the middle of March, the atmosphere becomes as clear as a diamond, deciduous trees burst at once into bloom, and then into leaf, while the bright green of the valleys follows the retiring snow-line steadily up the mountain slopes. The summer is not unpleasant in its onset, accompanied as it is by refreshing breezes and full streams from the higher melting snow banks. Springs of sweet water, fed largely from the surface, bubble forth everywhere. But as the season advances the drought increases, every stirring air, near or far, raises a cloud of alkaline dust until the atmosphere is full of it. Sometimes a shower precipitates it, but there are more dry than wet storms. The springs fail or become impregnated with mineral salts, and the streams run low or dry up. Vegetation dies in the fierce and prolonged heat and drought, if not artificially watered. Still, from the rapid radiation of the earth's heat, the nights are always agreeably cool, and the heat itself seems to have but slight debilitating quality. The presence or absence of the sun has a marked effect on the temperature from the great transparency of the air. Let his rays be cut off, even in July, and a fire is pleasant; while, if they have free passage, the fires are allowed to go out even in January. October ushers in a different state of things. The atmosphere clears up again as in spring, and the landscape softens with the

rich browns, russets and scarlets of the dying vegetation, which reaches up the mountain sides to their summits in places; but on them the gorgeous picture is soon overlaid by the first snows of approaching winter. The fall is a delightful season, and is generally drawn out nearly to the end of the year.

We have been more particular in stating the peculiarities of the climate of Utah because it is just now, and as we think justly, recommended for its sanitary qualities in certain diseases. The following summary of the classes and forms of disease in which it has been found most beneficial has the authority of four very eminent army surgeons—Surgeons P. Moffatt, Charles Smart, E. P. Vollum and J. F. Hamilton; and will, we believe, be found to be sustained by the experience of most of those who have gone thither for health. It is important, however, that health-seekers should spend as much of every day as possible in the open air.

High altitudes and areas of low barometric pressure quicken the respiration and circulation, and are therefore unfavorable in cases of pulmonary disease that are far advanced, and also in heart disease, and that form of chronic bronchitis associated with it. The other forms of chronic bronchitis, chronic pneumonia, and phthisis, are the diseases, par excellence, upon which such localities exercise a favorable influence. Consumption does not originate here, and where the monthly fluctuation of the thermometer does not exceed 50° , and the mean monthly temperature is at, or, within limits, above 50° , and the humidity is under 50 per cent., a residence is beneficial to consumptives, if commenced early enough. The best treatment known for consumption is a year of steady daily horseback riding in a mountainous country, diet of corn bread and bacon, with a moderate quantity of whiskey.* The beneficial influence of the climate on asthma is decided. It cannot exist here, except in a relieved and modified condition. Bronchitis appears in a mild form during the wet and thawing periods of spring and fall, but it always yields to treatment. Rheumatic fevers are scattered over the months without reference to season; but very few cases become chronic.

* The more moderate the better.—L. P. B.

The intermittents are imported, and the tendency in them is to longer intervals and ultimate recovery. A remittent, called "Mountain Fever," is indigenous. It yields readily to simple treatment if attended to in time, but if not develops into a modified typhoid, which is liable to prove fatal. Experience in the miners' hospitals at Salt Lake City shows that the climatic conditions are very favorable to recovery from severe injuries. The summer heat is great, but not debilitating, and the dry pure air and cool, invigorating nights, enable patients to sustain the shock of surgical operations that could not often be safely attempted in more humid climates. Pyemia, or blood poisoning, the frequent accompaniment of severe injuries and of surgery, is of extremely rare occurrence. One has a choice of altitude, ranging from 4,300 to 7,000 feet above the sea, with access to mineral springs, hot and cold, of decidedly efficacious qualities in the cure of many ills, as experience has amply shown; and for the whole of Salt Lake Basin, the softening and other healthful influences of at least 3,000 square miles of salt water, giving off a saline air, and affording the benefits of ocean bathing without its discomforts and dangers. The waters of the lake are so dense with the salt in solution that it is impossible to sink in it, and at the same time so pleasant that the bather can remain in the water all day without serious inconvenience or injury.

Temperature, etc., at Camp Douglas.

MONTHS.	7 A. M.	2 P. M.	9 P. M.	Diurnal Variation.	Percentage of Sick
January	28	35	29	7	33.60
February.....	23	34	24	11	31.30
March.....	33	47	39	14	32.33
April.....	38	50	41	12	36.42
May.....	45	55	47	10	28.74
June.....	61	77	65	16	29.28
July.....	68	85	73	17	23.86
August.....	65	80	69	15	25.38
September.....	56	74	62	18	20.00
October.....	41	56	45	15	21.97
November.....	38	53	41	15	38.68
December.....	22	51	24	9	40.50

The preceding table relates to Camp Douglas, which is on an

elevation two miles east of Salt Lake City and 500 feet above it, being 4,862 feet above the sea. This table gives the diurnal variation of temperature at 7 A. M., 2 P. M. and 9 P. M. for each month of the year, and the effect of this variation in reducing or increasing the percentage of the sick in the hospital connected with the camp.

The mean temperature of June to September inclusive at 2 P. M. was 79° ; at 9 P. M. 57° ; difference 22° ; mean percentage of sick for these months, 24.63. For the other eight months the mean at 2 P. M. was 47° ; at 9 P. M. 36° ; difference 11° . Mean percentage of sick for these months, 32.93. The months of greatest mean diurnal variation seem to be the healthiest months. Attention is called to the mean temperature of the four warmest months, at 9 o'clock in the evening, viz., 57° ; a night temperature which ensures quiet sleep.

The second of these tables shows the annual mean, maximum, minimum and range of temperature, and annual rainfall at Camp Douglas for sixteen years, 1863-1878.

YEARS.	TEMPERATURE.				RAINFALL.
	Mean.	Max.	Min.	Range.	Inches.
1863.....	52.93	103	7	96	7.47
1864.....	52.22	97	-4	101	14.92
1865.....	50.11	100	6	94	15.51
1866.....	51.87	94	9	85	22.29
1867.....	52.71	95	0	95	26.14
1868.....	50.66	96	5	91	17.25
1869.....	53.61	97	7	90	22.32
1870.....	51.66	96	4	92	20.96
1871.....	53.09	104	8	96	23.12
1872.....	50.42	91	0	91	18.12
1873.....	49.26	98	-3	101	17.37
1874.....	50.18	97	8	89	19.55
1875.....	51.26	95	9	86	21.07
1876.....	50.64	99	8	91	18.31
1877.....	51.00	98	5	93	14.52
1878.....	51.29	93	8	85	17.86
Mean for 16 years.....	51.43	97	5	92	18.58

Mines and Mining Products.—With her increasing population, it is hardly probable that Utah will produce more grains, etc., than sufficient to supply the home demand for agricultural products. She may export some wheat, but she will import more corn; she may have more than a supply of some fruits and root crops, but she will import as much or more of others.

She may have cattle, sheep, and possibly horses and mules to export, and as her grazing lands become developed, there may be a large traffic in live-stock, for which she has good facilities.

But the chief attraction which Utah possesses for immigrants is its mineral wealth. Looking southward from one of the summits of the Wahsatch Mountains, just above their junction with the Uintah Range, and the smoke of the smelters and stamp mills is seen in the clear pure air for a hundred miles, and on both sides of the Wahsatch; while to the east and southeast the mines of copper, coal, sulphur, alum, borax, graphite and other minerals, with some gold and silver, are found in great abundance.

There is not a county in the Territory where mines have not been located, and mining districts in greater or lesser number organized. These mining districts now cover over 1,200,000 acres. They are, perhaps, most numerous in Salt Lake, Utah, Juab, Beaver, Box Elder, Tooele, Millard, Pi-ute and Iron counties, but Washington county, Weber, Davis and Summit are coming into prominence either for their silver mines, gold placers, or deposits of coal, sulphur, borax, alum, etc. We cannot undertake to name all these mines or mining districts; but a few notes in regard to some of the most prominent of them will be interesting. Bingham Cañon and its chief town, Bingham City, is about thirty miles southwest of Salt Lake City, and is a rift or cañon of the Oquirrh Mountains, through which a small muddy creek flows on its way to the Jordan river, about twelve miles south of Salt Lake City. It has had strange vicissitudes. In 1859 rich gold placers were found there by General Conner's soldiers, and were extensively worked and still yield fair pay for working. In

1869 extensive beds of silver lead ore were discovered and mined with decided profit, and some of the mines are still profitably worked; in 1876 it was discovered that the disintegrated rock which had been thrown aside from the silver mines as waste really contained from \$19 to \$25 of gold to the ton, and was very easily reduced, and as this paid better than the silver, the mining for these quartz-gold ores was immediately resumed. Meanwhile, however, some of the silver mines in the cañon had been written up and their productiveness eulogized, and one of these, the Old Telegraph, which was really worth perhaps from \$700,000 to \$1,000,000, was sold after examination to a French company for \$3,000,000. The mine has not only never paid a dividend, but is run either at a loss or without profit, although all its reduction works and the appointments of the mine are of the first class. It was another instance in which silver mines in Utah have been sold to European capitalists at prices far beyond their actual value. The sales of the Little Emma, Flagstaff and McHenry, all Utah mines, are still fresh in the public memory, and have entailed an unwarranted disgrace upon mining properties, especially in Utah. The Little Cottonwood Mines, which included the Emma and Flagstaff, are now developing other mining properties there; but the frauds connected with those mines have destroyed confidence in them, and the present and prospective yield is not sufficient to restore it. The Parley's Park Mines, in the vicinity of Park City, of which the Ontario Mine is the principal, have an excellent property, though in their case the failure of the McHenry Mine to make good the representations under which it was sold, has proved a serious drawback. The mill connected with this mine shipped East, monthly, in 1879, from \$135,000 to \$145,000, and new mines in the vicinity are promising well. On the Oquirrh Mountains there is also the Ophir District, which has the Hidden Treasure and many other silver mines of note; the Stockton Mines, which have already yielded largely; and the Tintic Silver District, the mines in which carry gold, silver and copper. In Southern and Southwestern Utah, within the Great Basin and south of Sevier lake, there are many silver mines of great value, and which are

conducted on sound business principles. In this region the mines are richer as we proceed toward the southern boundary. In the Beaver Lake District there are valuable copper mines, and a little to the east and southeast are silver mines in the same district, and some valuable mines in the Ohio District. A little farther south are the Frisco Silver Mines, to which point a branch of the Southern Utah Railway is running. Among these mines, the Horn Silver Mine, about one mile from the village of Frisco, is said to be the richest silver mine in the world. Professor J. S. Newberry, who visited it in the autumn of 1879, and examined it very carefully, estimated that there was not less than \$15,000,000 worth of ore in sight, and a fair prospect of at least as much more when the mine was fully developed. This ore is chlorides and horn silver. The Carbonate and Rattler Mines, and the Cave Mine in the same vicinity, are carbonates easily reduced and very rich; the last named carries considerable gold; as do the Picacho Mines. Around and just below Little Salt lake are the Silver Belt and the Sumner Mining Districts, and in the same vicinity immense coal beds and extensive deposits of iron and alum. Other coal measures are still farther south, and in the extreme southwest is the Leeds Silver Mining District, which has many rich mines; most of these are chlorides and easily reduced. East of the Leeds District, and on and near the Rio Virgen, is the Harrisburg District, in which are a large number of excellent mines. Among these are those of Silver Reef, where sandstone beds of cretaceous or tertiary age are found impregnated with silver, either native or in chlorides. The Stormont Silver Mining Company owns several mines on Silver Reef, and is steadily producing from \$40,000 to \$50,000 of bullion per month, with a fair prospect of increase with larger facilities for reduction. No smelting is needed, but the reduction is effected through stamp-mills and wet amalgamation. Just at the boundary of Utah, Arizona and Nevada is the Silver Park District, where the argentiferous deposit is an enormous but irregular vein lying in the contact between porphyry and limestone. Some of the ore is very rich, and Professor Newberry says that "it seems to present very much the same problems as the great

veins of the Shakspeare District, New Mexico, or the Ruby Hill District, Nevada; that is, they are very good or good for nothing, and considerable time and money will be required to decide which is true."

The eastern slope of the Wahsatch Mountains undoubtedly contains both silver and gold, though, whether it is likely to be of ores which will prove profitable for present working, is a question. The Great Colorado Basin, which has shown itself so rich in the precious metals in Colorado and Arizona, is probably equally rich here. But we know that copper, and iron, and coal are not only abundant but that they are of excellent quality and easily worked. The coal beds of Utah contain coal of good quality, sufficient to supply the entire region west of the Rocky Mountains. It is bituminous or semi-bituminous in character, and many of the beds, Professor Newberry says, are excellent coking coals. Whether it is a lignite of the Tertiary formations, or a true coal of the Carboniferous era, does not seem to be fully settled. Possibly the deposits of the north are of a later geologic age than those of the south. Volcanic action, here as in New Mexico, may have wrought some changes in it. The iron is of all varieties, and is pronounced by skilful iron masters equal in quality to any in the world, and the quantity is vast beyond conception. Its close proximity to good coking coals and the excellent fluxes close at hand insure very cheap production of the best qualities of iron, and already several large furnaces are at work.

Recently antimony has been discovered. The antimony mines are situated 200 miles south of Salt Lake, and on the headwaters of the Sevier river.

Objects of Interest.—In wild, grand, and terrible displays of the power of the forces of nature, Utah is perhaps unsurpassed by no State or Territory of "Our Western Empire." The cañons of the Green and Grand rivers and of the Rio Colorado, which they unite to form, as well as those of the San Juan, have been most graphically described by Colonel J. W. Powell and other writers who have descended these rivers for a part or

the whole of their course. The greater part of the main stream of the Green river, more than a hundred miles of the Grand river, and about 250 miles of the course of the Colorado, including some of the most remarkable cañons of each, are within the bounds of Utah, and east of the Wahsatch Mountains. Near the southern boundary of the Territory the Monument Cañon of the Colorado commences, and at the mouth of the San Juan is the famous Temple of Music, one of the most wonderful of the results of erosion on these rocks. But it is not the Colorado Basin alone which abounds in remarkable natural scenery. The Great Interior or Salt Lake Basin is full of wonders. Among these are the Temples on the Rio Virgen, the only affluent of the Colorado which has its sources in the Great Salt Lake Basin; while the Little Zion Valley, north of that river, is remarkable for its quiet beauty.

Farther north, in the Great Basin, are some very extraordinary combinations of cañon, cataract, valley and mountain spires. Of one of these—the American Fork Cañon of the Wahsatch Mountains, which opens upon the minor Basin of Utah lake, and has been called the Yosemite of Utah—a recent writer thus speaks:

“This cañon is noted not only for the towering altitude of its enclosing walls, but for the picturesqueness of the infinite shapes, resembling artificial objects, towers, pinnacles and minarets chiefly, into which the elements have worn them. At first the formation is granite and the cliffs rise to a lofty height almost vertically. Then come quartzite or rocks of looser texture, conglomerates and sandstones; the cañon opens to the sky and you enter a long gallery, the sides of which recede at an angle of forty-five degrees to a dizzy height, profusely set with these elemental sculptures in endless variety of size and pattern, often stained with rich colors. ‘Towers, battlements, shattered castles, and the images of mighty sentinels,’ says one, ‘exhibit their outlines against the sky. Rocks twisted, gnarled and distorted; here a mass like the skeleton of some colossal tree which lightning had wrenched and burnt to fixed cinder; there another, vast and overhanging, apparently crumbling and threatening to fall in ruin. At Deer creek the cañon proper ceases, the road has

climbed out of it 2,500 feet in eight miles. This is the main resort of pleasure parties. Since the railroad was taken up, its bed has become a wagon road, which continues to Forest City, eight miles above. The surroundings are still mountainous, but there are breaks where the brooks come in, grassy hills, aspens and pines.

"To the sublimity of the cañon scenery in summer an indescribable beauty is added in the autumn, when the deciduous trees and shrubbery on a thousand slopes, touched by the frost, present the colors of a rich painting and meet the eye wherever it rests. To get the full benefit of this, one must go up and up till there is nothing higher to climb. In winter another and very different phase succeeds. The snows, descending for days and days in blinding clouds, bury the forests and fill the cañon. Accumulating to a great depth on high and steep acclivities, they start without warning and bury in ruin whatever may be in their track. Hardly a year passes that miners and teamsters, wagons and cabins are not swept away and buried out of sight for months. The avalanche of the Wahsatch is quite as formidable as that of the Alps. Probably forty feet of snow falls on the main range every winter. Seven miles of tramway in Little Cottonwood Cañon are closely and strongly shedded for defence against the awful avalanche. Even this is not always effectual."

The Great Salt lake itself is an object of great interest. The remarkable density of its waters, which at some seasons and particularly in times of great drought, is so strong a brine as to contain two pounds of salt to the gallon of water, its islands which contain rich deposits of silver and copper and abound in game, its shores covered with salt, and the buoyancy of its waters, in which one cannot sink, all excite the wonder of the visitor.

The *mineral and hot springs*, which abound throughout the Territory, are worthy of notice. The hot springs near Ogden are a favorite resort for tourists.

Historical Data.—Utah derives its name from the Utes, a tribe of Indians who were its original inhabitants. The Mormons, driven from Illinois and Missouri, emigrated hither in 1847 and 1848, and established themselves in a region then remote from other inhabitants. The title of this region passed from Mexico to the United States with that of New Mexico and California, in 1848, by the treaty of Guadalupe-Hidalgo. It was organized as a Territory in 1850 by the name of Utah ; but the Mormons called it “Deseret,” and in 1862 formed a Constitution, and demanded admission into the Union under that name. This was refused, and there has been much controversy, and sometimes threatened violence by the Mormons, since that time. In 1857 a most atrocious massacre of a large party of emigrants was perpetrated under Mormon direction at Mountain Meadow, in the southern part of the Territory. Some of the actors in that massacre were hung for it in 1877. Most of the mining enterprises which have brought in so considerable a non-Mormon population have been undertaken since 1869. It was admitted as a State to the Union, Nov. 11, 1889.

CHAPTER XX.

WASHINGTON.

WASHINGTON is, with the exception of Alaska, which is not yet organized, the extreme northwestern member of “Our Western Empire,” lying between the parallels of $45^{\circ} 32'$ and 49° north latitude ; and between the meridians of 117° and $124^{\circ} 28'$ west longitude from Greenwich. It is bounded on the north and northwest by British Columbia, the boundary line being a zig-zag one to give Great Britain the settlements and lands she claimed. Our title ran legitimately along the 49th parallel

to the Pacific; but to have insisted on this would have given us the greater part of Vancouver Island, on which were already important British settlements. The line was finally run, not without a long and tedious arbitration, through the centre of the Strait of Juan de Fuca, the Canal de Haro, and the Gulf of Georgia as far as to the 49th parallel. From the centre of the Gulf of Georgia to the west line of Idaho, the northern boundary is along the 49th parallel. The eastern boundary is the Territory of Idaho, along the 117th meridian to Lewiston, where the Snake river makes a sudden bend southward, when that river becomes the eastern boundary to the Oregon line; southward, Oregon forms its limit, the line running along the 46th parallel till it reaches the Columbia river at about the 119th meridian, when the Columbia becomes the southern boundary to the Pacific; on the west, it is washed by the waves of the Pacific as far as the Strait of Juan de Fuca. Its length from north to south ranges from 200 to 250 miles, its greatest breadth from east to west about 360 miles. It is smaller than most of the Territories, and several of the States of "Our Western Empire," having but 69,994 square miles, or 44,796,160 acres; yet this area is one and a half times that of New York or Pennsylvania.

Topography and Divisions.—The State is popularly divided into Eastern and Western Washington by the Cascade Range of mountains, which trend north-northeast from Oregon in a very disorderly fashion from the Dalles of the Columbia river to the line of British Columbia, following for most of the distance the west bank of the Columbia river, and extending in parallel ridges west-southwest to Puget sound, and eastward in several spurs north, east-northeast, and east-southeast. Almost the entire region between the 47th and the 49th parallels lying between the Columbia river and Puget sound is broken, rolling and mountainous, though the mountains are not high.

Western Washington, the part of the territory first settled, consists of a valley or basin, known as the Puget sound basin, and which lies between two ranges of mountains, the Cascade Mountains on the east and the Olympian or Coast Range on the west. The Puget sound or archipelago, the Mediterranean of

the Western Continent, as it is often called, extends from the British line on the north (the Gulf of Georgia penetrating several hundred miles into British Columbia) to Olympia on the south. It includes the Straits of Juan de Fuca, which furnish a broad channel into the Pacific, the Canal de Haro, Washington Sound, the Gulf of Georgia, Bellingham Bay, Rosario Strait, Admiralty Inlet, Hood's Canal, Lake Washington, several smaller passes and inlets, and Anderson's Bay, the latter items and some others going to make up the smaller Puget sound. It has a coast line in the Territory of 1,594 miles, and its area within the limits of the Territory is over 2,000 square miles. More than thirty-five years ago Captain (afterwards Rear Admiral) Wilkes, who had been engaged on a protracted voyage of exploration of the Pacific coast, said of this sound :

"Nothing can exceed the beauty of these waters and their safety. Not a shoal exists within the Straits of Juan de Fuca, Admiralty Inlet, or Hood's Canal that can in any way interrupt their navigation by a 74-gun ship. I venture nothing in saying there is no country in the world that possesses waters equal to these. They cover an area of about 2,000 square miles. The shores of all these inlets and bays are remarkably bold ; so much so that in many places a ship's side would strike the shore before the keel would touch the ground. The country by which these waters are surrounded is remarkably salubrious, and offers every advantage for the accommodation of a vast commercial and military marine, with convenience for docks, and a great many sites for towns and cities, at all times well supplied with water and capable of being well provided with everything by the surrounding country, which is well adapted for agriculture.

"The Straits of Juan de Fuca are ninety-five miles in length, and have an average width of eleven miles. At the entrance (eight miles in width) no danger exists, and it may be safely navigated throughout. No part of the world affords finer inland sounds, or a greater number of harbors, than are found within the Straits of Juan de Fuca, capable of receiving the largest class of vessels and without a danger in them which is not visible. From the rise and fall of the tides (eighteen feet) every

facility is offered for the erection of works for a great maritime nation. The country also affords as many sites for water-power as any other."

The foothills and slopes of the mountains on both sides are almost wholly covered with immense forests of fir and cedar, reaching to the very summits of the mountains. Flowing down from the western slope of the Cascade Range, ten rivers empty into Puget sound, viz.: the Nisqually, Puyallup, White, Cedar, Snoqualmie, Snohomish, Stillaguamish, Duwamish, Skagit, and Nooksakh, affording many hundred miles of inland shore line for logging purposes, and having in their valleys an estimated area of two thousand square miles of alluvial agricultural lands. Most of these rivers are navigable for steamers of light draft, generally as far up as the alluvial deposits extend. The streams descending eastward from the Olympian or Coast Range, except the Skokomish and the Dungeness, are shorter and of less importance. The mountains approach close to the western shores of the sound, limiting the area of available territory; but their sides are covered with vast forests of valuable timber already known to the markets of the world. Between the Olympian or Coast Range and the Pacific are some arable lands, but the soil is not so rich, though well adapted to the growth of timber. There are two moderately good harbors here—Gray's Harbor, and Shoal-water bay, extensive and partially land-locked bodies of water, but in respect to depth and facility of loading and unloading bearing no comparison to the magnificent harbors of Puget sound. The Chehalis is the principal stream flowing into Gray's Harbor; it has numerous affluents. The Willpah and some smaller streams fall into Shoal-water bay. There are numerous small rivers flowing into the Pacific and the Straits of Juan de Fuca. The other streams of Western Washington are affluents of the Columbia. The Cowlitz and Klikitat are the most important. All of Western Washington is well watered.

Eastern Washington includes all that part of the Territory lying east of the Cascade Mountains, and consists of the Great Plains of the Columbia river, the Great Plateau of the Spokane, and numerous valleys or river bottoms, as of the Columbia, Snake

river, Walla-Walla, Clarke's fork, the Okinakane, Wenatchee or Pisuouse, Lake Chelann, the Grand Couleé, or Old Bed of the Columbia, the Spokane, Colville and Palouse rivers. This whole region is an elevated plateau, with a rich soil, well adapted to the culture of the cereals, and one of the finest grazing countries in the world.

There are many lakes in Washington, some of them of considerable size; Lake Chelann is the largest, but Lakes Kahchess, Washington and Whatcom are also important lakes.

Geology.—The shores of the Pacific, the lower valley of the Columbia, and the great valley drained by Puget sound, are Tertiary and Quaternary; the islands west of the Canal de Haro in the Gulf of Georgia are Cretaceous; the vicinity of Bellingham bay is Carboniferous; the Coast Range is Eozoic; the Cascade Mountains to about $47^{\circ} 40'$, and the Great Plains of the Columbia river in Central and Eastern Washington, south of the Spokane river, are volcanic; Northern Washington is Eozoic, except two narrow and small outcrops of Silurian age in the extreme northeast, one east, the other west of Clarke's fork.

Mineralogy.—Washington has probably some deposits of the precious metals in the extensive volcanic regions already noticed, but they have not yet been developed to any great extent. Gold has been found in the northeast near the Columbia river. There were discoveries of placer gold made in 1879, on the Skagit river in Whatcom county, Western Washington. The quartz lodes near the Columbia river, in Stevens county, yielded in 1879 about \$300,000. All the different ores of iron are plentiful; but the greatest mineral wealth of the Territory consists in its extensive beds of excellent coal. The coal near Bellingham bay and Lake Whatcom, in Whatcom county, is of excellent quality and is extensively mined. Much of it is sent to San Francisco, where it is in great demand. This is a true coal from the coal measures, and is bituminous in its character. There is also a very good coal (probably lignite) back of Seattle, in King county, near Lake Washington, and also in the Coast Range. This coal is mostly bituminous, but it is claimed that deposits of anthracite coal have been found in Puyallup valley and on the Green river. This is

possible, as this is within the limits of the volcanic region, but it is probable that this is at most only semi-anthracite.

Zoölogy.—The wild animals are the same as in Oregon. In the northern part of the Territory moose are found in considerable numbers. Elk are also plenty. The cougar or panther is large and fierce. Game is abundant. Salmon are found in great numbers, not only in the Columbia but in Puget sound, and some of the rivers flowing into it.

Climate.—The climate of Western Washington is remarkably mild and temperate, notwithstanding its high latitude, resembling, in this respect, that of the British Isles, and demonstrating the truth of the law laid down by physical geographers that the *western* coast of a continent always has a much milder and more equable temperature than the *eastern*. Governor Ferry, in presenting, in his report of October, 1879, to the Secretary of the Interior, the meteorological table of Fort Blakeley, which we give on page 1195, makes some very judicious notes and explanations in regard to it, and the climate of Western Washington, which we here insert in full, and which are fully corroborated by the corresponding table of Olympia, which we have placed by its side. One point, which the governor has omitted, is worthy of notice, viz.: that where the extreme annual range of the thermometer does not exceed from 64° to 74° , its maximum not being over 95° nor its minimum less than 19° to 25° , the resulting climate is as agreeable, healthful and productive as can be desired. The rainfall is by no means excessive, but exerts a decided influence in promoting the gigantic growth of the timber, which crowns the mountain slopes and extends even to the summits of the Cascade and Coast Ranges.

Governor Ferry says:

"It will be seen that the lowest temperature during this period of twenty-six months was 25° above zero, in January, 1879, and the next lowest 26° , in January, 1878. The highest temperature in 1877 was 88° ; in 1878, 94° ; and in 1879, 86° . The highest monthly average was $67\frac{1}{4}^{\circ}$, in July, 1877, and the lowest $40\frac{1}{2}^{\circ}$, in January, 1878. It will also be seen that the annual average rainfall is very little greater than in the Eastern and Western

METEOROLOGY OF WESTERN WASHINGTON.

FORT BLAKELEY, Bainbridge Island, Kitsap Co.

Latitude $47^{\circ} 36'$ Longitude $122^{\circ} 34'$ west from Greenwich.

Elevation about 36 feet.

TIME.	TEMPERATURE.			HUMIDITY.			TIME.	TEMPERATURE.				HUMIDITY.		BAROMETER.
	Highest.	Lowest.	Average.	Rainfall.	Cloudy Days.	Clear Days.		Mean.	Highest.	Lowest.	Range.	Rainfall.	Mean.		Average Mean Pressure.
1877.							1877.							
June.....	80	45	59½	3.57	18	12	July.....	0	0	0	inches.	per ct.	inches.	
July.....	88	50	67½	0.55	11	20	August.....	63.4	92	43	49	0.24	64.8	30.270
August.....	86	50	65	1.90	16	15	September.....	62.5	85	43	42	1.64	73.3	29.070
September.....	86	42	57½	4.10	18	12	October.....	55.6	81	36	45	6.64	78.3	29.068
October.....	64	42	51½	3.25	12	19	November.....	49.1	66	29	37	7.00	87.8	30.040
November.....	59	31	47½	8.70	23	10	December.....	45.8	57	28	29	19.88	87.5	29.957
December.....	56	29	43½	4.40	21	10		42.2	57	30	27	11.73	89.7	29.991
Seven Months.....				26.47	116	95	Six months.....							
1878.							1878.							
January.....	52	26	40½	5.08	18	13	January.....	41.1	52	25	27	9.82	89.1	29.810
February.....	64	32	45¾	10.22	10	9	February.....	44.1	54	32	22	14.20	87.3	29.688
March.....	79	38	50½	5.17	14	17	March.....	47.5	65	32	33	7.99	86.7	29.878
April.....	76	33	52½	2.15	13	17	April.....	40.1	71	30	41	1.21	74.3	29.959
May.....	90	36	57¼	3.25	15	16	May.....	55.2	87	34	53	1.36	70.8	30.003
June.....	94	43	63½	0.36	9	21	June.....	60.4	95	41	54	0.24	67.5	30.025
July.....	82	50	63½	0.76	5	26	July.....	61.0	82	45	37	0.98	69.7	29.971
August.....	84	44	62½	0.20	2	29	August.....	62.5	82	43	39	0.32	69.7	29.959
September.....	86	42	57½	3.35	10	20	September.....	54.4	78	37	41	4.87	77.9	29.986
October.....	68	34	50½	2.61	14	17	October.....	47.4	64	28	36	4.32	87.9	30.091
November.....	60	33	46½	9.27	19	11	November.....	44.2	58	31	27	1.09	88.7	30.091
December.....	56	30	41½	3.27	21	9	December.....	39.6	54	22	32	7.03	87.5	30.218
Year.....	94	26	52.6	46.59	159	205	Annual.....	54.75	95	22	73	63.34	79.9	29.994
1879.							1879.							
January.....	50	25	40½	5.85	20	11	January.....	36.2	48	19	29	5.06	83.4	30.045
February.....	58	28	45½	0.70	17	11	February.....	40.2	54	24	30	15.50	88.3	29.666
March.....	69	32	47¾	13.70	19	11	March.....	44.8	65	29	36	1.46	85.8	29.871
April.....	73	36	50	4.44	12	12	April.....	48.6	69	32	37	4.10	78.6	30.030
May.....	80	40	55½	5.00	12	19	May.....	52.4	76	35	41	4.72	78.6	29.998
June.....	82	42	58½	3.30	17	13	June.....	57.8	76	38	38	2.44	69.9	30.050
July.....	86	45	61½	2.55	7	21	July.....	67.0	83	45	38	2.62	69.7	30.268
Seven months.....				44.54	104	105	Seven months.....							

OLYMPIA, Thurston Co., Capital of Territory.

Latitude $47^{\circ} 21'$ Longitude $122^{\circ} 56'$.

Elevation, 36 feet.

States. From June, 1877, to January, 1879, a period of nineteen months, embracing all of one winter and half of another, there was no snowfall, and in January, February and March, 1879, only $7\frac{1}{4}$ inches, which disappeared almost as rapidly as it fell. The greatest rainfall is between the months of October and April, although, during this period, it will be seen that the cloudy days are very little in excess of the clear.

"The climatic phenomena indicated by these observations are readily accounted for.

"A thermal current, known as the Japan Current, having its origin at the equator, near the one hundred and thirtieth degree of east longitude, Greenwich, flows northwardly to the Aleutian islands, where it separates, one branch flowing eastwardly along the peninsula of Alaska, and then southwardly along the coast of British Columbia, Washington Territory and Oregon. This thermal stream, with its concomitant heated atmospheric current, striking the northwest coast of America, operates powerfully in mitigating a climate which otherwise would be cold and rigorous in the extreme. The effect of these currents upon the western portion of this Territory is the same as the effect of the Gulf stream upon the northwest coast of Europe. In fact the climate and natural productions of England are essentially the same as those of Western Washington. In addition to this, the prevailing winds in the winter are from the southwest. These warm atmospheric currents, coming from the tropical regions of the Pacific, laden with moisture, meeting the cooler currents from the Coast Range and Cascade Mountains, produce the winter rainfall. These southwest winds also moderate the temperature during the winter.

"The prevailing winds during the summer are from the northwest, which is the cause of the dry, cool weather during that period. There is a marked difference between the climate of Western and Eastern Washington. In the latter, being that portion of the country lying east of the Cascade Mountains, the four seasons are plainly distinguishable. I am unable to present meteorological statistics of this portion of the Territory, and can only say that the temperature is lower in winter and higher in

summer, and that the rainfall is about one-half less, than on Puget sound. The average annual temperature is reported as follows: spring, 52°, summer, 73°, autumn, 53°, and winter, 34°."

The summers are at times very hot, though with cool nights generally. A part of the winter is cold, and there are usually a few days in which the mercury falls to zero, or below; but with few exceptions the fall of snow is not heavy. The rainfall averages from twenty to twenty-two inches for the year.

The "Chinook winds," already spoken of under Montana, periodical warm breezes from the southwest, blow up the channel of the Columbia river, through the fall and winter, and along the foot-hills of the Blue Mountains, and in a few hours remove every vestige of snow in their path. Their influence is felt all over Eastern Washington and Idaho and into Montana.

Soil, Vegetation and Agricultural Productions.—The soil of *Western Washington* is of various qualities, and may be divided into river bottoms, lands along the sound, table-lands and mountain slopes.

The alluvial farming lands are subject to overflow, near the sound, but not usually to an injurious extent. The freshets generally occur during the months of January and June, and rarely last more than three or four days. The soil is composed of clay, sand and gravel—detritus washed from the mountains—mingled with decayed vegetation, the rank growth of centuries. Under cultivation it is quick, light and friable, and yields astonishing crops of hay, grain, hops, fruits and vegetables. These lands are mostly covered with vine-maple, alder, crab-apple and salal, with an occasional fir, spruce or cedar, and as a rule are confined to narrow valleys and limited, detached areas. Being covered with this deciduous forest growth, they are not like prairie lands, where the plow can be started as soon as a claim is staked out—but as compared with the more heavily timbered uplands, they are easily cleared—at an approximate cost of \$10 to \$15 per acre. The wood and lumber will usually pay for the work; and, for farming purposes, the settler will find no more desirable location west of the Cascades.

Between these bottoms and the mountains are large areas of

table-lands, quite level or gently undulating near the rivers; broken and rugged toward the foot-hills. The soil of these uplands is inferior to that of the river lands, varying from sandy-loam to clay-loam and unproductive gravel. The growths here are principally fir and cedar, with some hemlock, maple, willow, cherry, etc. South and east of the sound is a district where coarse gravel is found, with occasional granite boulders, extending back from the shore from ten to thirty miles in streaks and patches, and covering perhaps half the land. In the intervals the soil is a strong, brown clay-loam of excellent quality for farming. Owing to the durability of the fir and cedar, and the difficulty and expense of removing their stumps from the ground, it will be a considerable time before the lands now covered with these fir forests will be cleared and devoted to agriculture—but fortunately the timber is worth far more to its owners and to the country than the best open prairie would be. Considering the great diversity of the soil and the wooded, broken character of the country, West Washington is likely to be a region of small farms, devoted to a variety of crops, rather than to growing grain or stock on a large scale.

With the above explanation it is safe to say that in connection with the mild climate, the productive capacity of the soil of the Puget sound region is great, both as to quantity and quality. The small grains are at home in Washington Territory. The quality and yield of wheat on the Pacific slope are well known to be good, and in this regard Puget sound basin is no exception to the rule. Much of the finest portion of the grain that reaches the Eastern market as "California wheat" is grown in Washington Territory and Northern Oregon. All other cereals are grown to perfection; oats are particularly plump and heavy. Indian corn (maize) has been ripened thirteen years in succession in one locality, and as many as forty bushels to the acre have been raised, but this is exceptional, and as a rule the nights are too cool for the ripening of this crop. Pork is usually fattened upon peas, wheat and barley, and it is claimed can be made as cheaply as upon corn in the Western States.

Fruits of all kinds, except the peach and the grape, are raised

in great profusion, and are remarkable for size and flavor. Although California fruit is justly in good reputation, Oregon and Washington apples are exported to San Francisco, where they bring an advanced price on account of their excellence. The potatoes and other vegetables grown on the north coast are also in high favor in the San Francisco market.

A resident of Washington, and one who has had extraordinary facilities for acquiring personal knowledge of the lands there, says:

"The agricultural lands of the State, while generally confined to the river bottoms, are not entirely so. It is frequently found that even on the sides, and sometimes near the summit of a hill or mountain, considerable tracts of rich *beaver dam* lands exist. A noticeable instance is near the summit of the immense hill immediately in the rear of Kalama. The river bottoms of the Columbia and its confluent streams, as well as the valley of the Cowlitz, contain large tracts of lands of unexcelled fertility. About midway between Kalama and Tacoma is the Chehalis Valley, embracing, with its confluent, over 2,000 square miles of the best agricultural lands in the Territory. This valley is to Washington what the Willamette is to Oregon. It varies in width from five to fifteen miles, and extends from the base of the Cascade Range to Gray's Harbor. Large quantities of rich lands lie in the bottoms of its lower tributaries. Flowing into Puget sound there are the Cedar, Nisqually and Puyallup rivers, on which are some fine arable lands. These river bottoms are usually sparsely timbered with alder, vine maple, crab apple, etc., which are quickly and easily cleared, at an expense ranging from five to thirty dollars per acre, and will then yield, on an average, from forty to sixty bushels of wheat per acre. The small grains are produced most abundantly, with a larger average yield than obtains in almost any other locality or section of the country, and command the highest market price at home. And so long as we have the large non-producing lumbering population, the farmers' market will be at home."

Timber.—At present the leading industry of the Puget sound region is the manufacture and shipment of timber. This timber

has carried its own fame to all parts of the world. In the East Indies, in Egypt, in the maritime States of Europe, in South America, the Pacific Islands, China and Japan, the fir timber of Washington Territory is an article of commerce.

Washington, to the west of the Cascade Mountains, covers an area of about 20,000 square miles (exclusive of interior waters), three-fourths of which are timbered lands. The timber consists of yellow fir, cedar, pine, spruce, hemlock, oak, maple, cottonwood, ash, dogwood, alder and some of the smaller varieties. The amount of the fir exceeds all the other varieties combined, and the cedar stands second in quantity. As the fir exceeds all other varieties in quantity, so also it does in utility, being valuable for ship-building, house-building, fencing, spars, and indeed almost every purpose for which wood is used.

The quantity of all kinds of lumber produced in the territory, in 1875, was estimated at 250,000,000 feet, valued at \$3,000,000, and though the market for it was temporarily depressed, the demand is now rapidly increasing.

The size of the fir trees and the number growing on given areas in good timber districts are almost incredible to those who have not visited the north Pacific coast. Trees are not uncommon which measure 300 feet in length, two-thirds of the distance being free from limbs. Fifty, sixty, and sometimes eighty good timber trees grow upon an acre of ground. It is not seldom that 200,000 feet of merchantable fir lumber is taken from a single acre. The rule with Washington lumbermen has been to work no tract of (fir) timber producing less than 30,000 feet per acre.

Although lumbering has been carried on along the shores of the sound for twenty years, up to the present time logs have seldom been hauled more than a mile—to the estuaries of the sound, or some convenient stream where rafts are prepared for towing to the mills: The main timber region of the sound and lower Columbia has not yet been invaded by the ax. Many rivers and arms of the sound extend into the very heart of this vast Forest Preserve, and by clearing the river channels of drift the spring freshets can be availed of to run out the logs to the mills and the lumber to market.

The regular correspondent of the *San Francisco Chronicle*, writing under date of December 18, 1879, gives the following interesting account of the soil, situation and productions of *Eastern Washington*: Eastern Washington Territory is probably destined to become the richest and most renowned wheat-growing region in the world. The great body of its arable land is the southern portion, known locally as the Walla-Walla, Palouse and Yakima countries, which have an unbroken area more than 150 miles square, extending from the foot-hills of the Cascade Mountains eastward to the Idaho boundary line, and from the Oregon line northward beyond the Great Bend of the Columbia river. But Eastern Washington in its entirety is distinctively an agricultural region of great fertility; for, in addition to its vast scope of rolling prairies and plains in the southern and middle sections, there are in its more northerly portion, and extending as far as to the British possessions, numerous rich and well-watered valleys, such as the Chemakane and Colville Valleys, the latter of long-standing fame. Eastern Washington has been described as the "valley of the Columbia river in Washington Territory, lying east of the Cascade Mountains." The appropriateness of this description will readily appear by an examination of the map, showing the courses of this river and its numerous tributaries. Here the climate is most favorable to health, the soil yields the largest average return of wheat, drought is unknown, the crops never fail, and the ultimate capacity for production of cereals of the highest grade has been estimated by good judges as high as 150,000,000 bushels per annum.

The Yakima country is in the southern central portion of the country between the Cascade Mountains on the west and the Columbia river on the east, and embraces the northern half of Klickitat and all of Yakima counties. It is traversed by a river of the same name, which, rising in the northern central portion of the Territory, flows southeastward, and empties into the Columbia a short distance from Ainsworth, at the mouth of the Snake river, the present western terminus of the Pend d'Oreille division of the Northern Pacific Railroad. The fertility of the Yakima country is declared to be not inferior to that of any other

part of this great wheat-field, not even excepting the Walla-Walla valley, farther east. The projected line of the Northern Pacific Railroad from the Columbia river at Ainsworth, across the mountains to Puget sound at Tacoma, passes through the heart of this region ; and the construction of a road over it is all that is needed to fill up the country speedily with a teeming population. It is yet sparsely settled, but new-comers in their prairie-schooners are fast encroaching upon its unoccupied lands. Its climate and soil are admirably adapted for stock-raising, which is the chief occupation of its inhabitants. The food for cattle is a very rich, nutritious bunch-grass, almost as strong as grain, with which the prairies and hills are covered throughout all seasons of the year ; and as the winters, with rare exceptions, are mild and dry, there is no need of housing and feeding the cattle, but they are without fear suffered to roam at will in the winter months, and grow fat on this remarkable grass. This bunch-grass is common all over that country, covering the foothills and plains alike, and sometimes even reaching to the mountain-tops.

J. Ross Browne, in an official report, says, " For grazing, these table-lands and side-hills of Eastern Washington cannot be excelled. They are covered with a luxuriant growth of native bunch-grass, of nutritious quality. During the rains of spring it seems to attain its growth ; and through the dry season which follows, it stands to be cured into the best of hay, preserving its strength and esculent properties all winter. Stock abandon the green grass of the bottom-lands to feed upon it, and on it they keep fat the year round." The Yakima country produces the cattle for supplying the market on Puget sound and elsewhere in Western Washington, as well as in British Columbia, whither they are driven through the several passes in the mountains ; and large droves of exceptionally fat cattle go annually out to the Union Pacific Railroad, and are transported to Chicago. Such is the great value of this region for stock-raising ; but, as the soil is of a character and productiveness that invite the change, the cattle-range on the lowlands must give way before the more profitable wheat-field, and confine itself higher up on the foot-

hills and mountain-sides. To the limited extent to which the Yakima country has gone in wheat-raising, it may safely challenge the best record of Illinois, Ohio, or any of the other Eastern or Middle States; for it has performed some wonderful feats, as well as to quality and size of grain, as to the amount of yield per acre. The railroad only is needed. Even thus early in the agricultural history of Eastern Washington, it is to be recorded that the last crop was of such dimensions as to defy the present facilities for moving it to market; the approach of cold weather and low water in the river, finding still on hand, in the store-houses at Wallula, a large residue of 20,000 tons—the year's production, there to remain until the opening of spring. This fact is a very persuasive appeal for the building of a railroad to Puget sound.

Passing eastward from the Yakima across the Columbia, we enter the already famous Walla-Walla Valley, which is bounded on the south and east by the Blue Mountains, and on the west and north by the Columbia and Snake rivers. Its area runs into millions of acres, as does that of the Palouse country to the north of Snake river, watered by the Palouse river, and extending far northward to the Spokane. The Walla-Walla and Palouse countries are being rapidly settled by people from all parts of the United States. These two regions of Southeastern Washington do not materially differ in their general character; so little, indeed, that a description of the soil, products, and climate of one, may answer for all three. The soil is of an appearance likely to surprise the average wheat-grower, being, except in the bottom-lands, a very light-colored loam, containing an unusually large percentage of the alkalis and fixed acids, and covering practically the whole of Eastern Washington to a depth of from one to twenty feet. Near the base of the mountains it is mixed with a larger proportion of clay, which renders it somewhat darker in appearance; but in no respect does it resemble the black soils of the Mississippi valley. One of the most remarkable features of this country is, that the soil on the tops of high hills yields as many bushels of wheat to the acre, as does that of the lowlands or prairies. This fact is sought to be explained by the theory,

that this soil on both hill and plain was once the bed of a system of lakes, and was greatly enriched by volcanic ashes blown from the Cascade Range, or thence carried by the streams into the lakes, and thus widely distributed over the entire basin, including the hills in question, which are supposed to have been under water. In the Walla-Walla and Palouse countries, towns are springing up in all directions—mere trading-camps at the outset for the farmers who are crowding in round about; and the hurry and flurry of settlement, and bustle and haste of preparation for wheat-raising, lends to some of the settlements an appearance resembling that of a mining-camp hastily pitched together, with many of the incidents common to the latter. The Palouse country is traversed about through its centre by the Northern Pacific Railroad, Pend d'Oreille division, and extends from the Columbia at the mouth of the Snake, northeast to Spokane falls, about a hundred and fifty miles. To Dr. Bingham is credited the discovery that this was valuable agricultural land. Although it was subject to entry at a dollar and a quarter per acre, no one thought it worth taking, until the doctor got an idea to experiment. He planted twelve acres in alfalfa; and, to the amazement of himself and neighbors, it grew more profusely and to a greater height than they had ever before known it to grow. Elated at this splendid success of his experiment, he at once set about procuring all the land he was able to buy, and is now said to be one of the most prosperous planters in the northwest. He tried wheat with a like brilliant result, securing an average yield per acre that paid for the land over and over again; and thus suddenly the good people of that region were awakened to the astounding revelation that their vast expanse of country known as the Plains of the Columbia, and, indeed, the whole of Southeastern Washington, instead of being, as it had always been regarded, an almost useless waste, had a wealth-producing capacity far exceeding that of all the gold and silver mines of California and Nevada. Immediately scores and hundreds of people jumped into the business of wheat-raising; and the fame thereof went abroad, starting westward and northward large numbers of farming people, some going through California and by sea, but a larger proportion

arriving from surrounding Territories in their prairie-schooners drawn by oxen. The experience of Dr. Blalock near Walla-Walla illustrates what may be done in the way of farming in Washington Territory. He began comparatively poor a few years back, and has now the largest farm in the Territory. He has one large field of nearly two thousand acres, which was partly in wheat and partly in barley during the season just closed, and the average yield per acre is reported to have been forty bushels. At the last harvest, it was not regarded as extraordinary for particular fields to yield an average as high as forty-five and fifty and even sixty bushels to the acre.

Of the enormous average yield of wheat on these "Great Columbia Plains," Mr. Philip Ritz, for fifteen years a farmer in the Walla-Walla valley, wrote in 1869: "I have seen large fields of wheat average fifty-six bushels to the acre, and weigh sixty-two pounds per bushel; and have seen fields which yielded forty to fifty bushels per acre from a volunteer crop; that is, produced the second year from grains scattered out during harvest, sprouting during the fall and growing even without harrowing."

Historical Data.—The region about Puget sound was a favorite resort of the Indian tribes for centuries. Both the hunting and fishing were such as to render the regular supply of food easy and certain. In 1840 there were 25,000 Indians who claimed Puget sound as their home. The number in the whole Territory is now but a little more than half as many, and the greater part of these are now domiciled along the upper Columbia river. As we have already said under Oregon, the Straits of San Juan de Fuca were first entered by a Greek navigator of that name in the Spanish service, in 1592; the coast was revisited in 1775 by Heceta, a Spanish navigator, and in 1787 and 1788 two English captains, Berkeley and Meares, successively entered the straits, and the latter revived the name of the old Greek discoverer. The priority of discovery of the coast and the straits certainly lay with the Spanish. In 1789 an American, Captain Robert Gray, in the sloop "Washington," discovered and entered several of the smaller bays and harbors along the coast, both in the Straits of San Juan de Fuca and below; and in 1790 Captain Kendrick, in

the same vessel, passed through the entire length of the Straits of San Juan de Fuca. In 1791 Captain Gray returned to the coast, and discovered and explored and gave his name to Gray's Harbor. It was in this same year also that he discovered and ascended the Columbia river about thirty miles. In 1805 Lewis and Clarke reached and explored the coast from the land side, having crossed the continent for that purpose. Meanwhile the title of the United States to the whole region watered by the Columbia river was further fortified by the settlement of Astoria, at the mouth of that river, by Mr. J. J. Astor, in 1811, and the title was perfected as against any European power by the treaty of Florida with Spain in 1819, which expressly ceded to the United States all the rights, claims and pretensions of the King of Spain to any Territory north of the forty-second parallel of north latitude. The Hudson's Bay Company attempted to take possession of it between 1825 and 1830, and from 1828 to 1841 it was held in joint occupancy by Great Britain and the United States, without prejudice to the title of either. The Ashburton Treaty of 1845 finally settled the right of the United States to the Territory up to the line of 49° north latitude, except at the Straits of San Juan de Fuca and the Gulf of Georgia. It was understood by that treaty that the American title took to the middle of the channel of those waters; but as there were several channels and some valuable islands in controversy, the matter was definitely and finally settled by arbitration in 1873, the Emperor of Germany being arbiter. American settlers began to come into the Territory in 1845. It was originally a part of Oregon Territory, but was organized as a separate Territory in 1853, and had a severe Indian war in 1855. From 1859 to 1863 it included most of Idaho Territory, but since that time it has had its present boundaries.

CHAPTER XXI.

WYOMING.

WYOMING lies between the 41st and 45th parallels of north latitude, and the 104th and 111th meridians of west longitude from Greenwich. It is bounded on the north by Montana, on

the east by Dakota and Nebraska, including in the northeast a considerable portion of the Black Hills region; on the south by Colorado and Utah; and on the west by Utah, Idaho and Montana. Its length from east to west is 335 miles, its width from north to south is 276 miles. It is a perfect parallelogram, all its boundaries being astronomico-geographical lines. Its area is 97,883 squares miles, or 62,645,120 acres, of which, up to June, 1879, only about one-seventh had been surveyed.

Topography.—The main divide of the Rocky Mountains, which, after traversing Northwestern Montana, turned suddenly south-westward and formed the southeast boundary of Idaho, separates again into two chains at the Yellowstone park, and enters Wyoming from the northwest in two distinct and nearly parallel ranges, the easternmost being known as the Shoshone range, and the westernmost as the Wind River range. Near the forty-third parallel, the Big Horn Mountains, a somewhat lower range from the north-northeast, meets them almost at a right angle, and from this point to the Colorado line both ranges break into a number of mountain groups extending in all directions, and rendering it difficult to define which has the best right to the name of the main range of the Rocky Mountains. Among the groups of this confused mountain mass may be named, beside the Big Horn range already mentioned, the Owl Creek Mountains, a spur of the Shoshone range, the Rattlesnake Mountains, and the Laramie Mountains, still farther east; the Sweet-Water and the Seminole Mountains, which seem to be continuations of the Wind River range. Near the forty-second parallel these mountain ranges subside into an elevated plateau from 8,000 to 9,000 feet above the sea, with occasional elevated summits, rising again to higher elevations on either side of the North Park in Colorado. This elevated plateau extends westward and southwestward to the foot-hills of the Bear River range on the west, and the Uintah Mountains on the south, both in Utah Territory. In the southeast there are the Medicine Bow Mountains, and some isolated peaks, like Laramie Peak, Iron Mountain, the Red Buttes, etc.; and in the northwest the Heart Mountains and the isolated peaks of the Yellowstone Park. In the northeast, east of the Big Horn

and north of the Laramie Mountains, there is an extended plateau of 4,000 to 7,000 feet elevation, rising at the east into the Black Hills, and in the northeast and north to the Powder River range and the Wolf Mountains.

The highest elevation in the State is probably Snow's Peak, in the Wind River Range, which is reported as 13,570 feet; the next is Gilbert's Peak, 13,250; Cloud Peak probably exceeds 13,000; and Lake Carpenter, in the Big Horn Mountains, is 11,000 feet above the sea. The average elevation of Yellowstone Park is 7,403 feet. The highest summit in the Wyoming portion of the Black Hills is Harney's Peak, 7,700 feet, while Red Buttes, in the southeastern part of the Territory, is 7,336 feet, and Laramie City, 7,123 feet. Laramie Peak is 10,000 feet and possibly a little more.

Rivers and Lakes.—No State or Territory of "Our Western Empire," or of the United States, is drained by streams which find their way to such widely separated seas, as Wyoming. In the northwest and west the Shoshone lake and its outlet through Jackson lake, the Gros Ventres creek, and the John Gray river, are all tributaries to the Lewis fork of Snake river, itself one of the constituents of the Columbia river, and these waters find their way to the Pacific by that route. In the southwest Bear river traverses Uintah county for fifty miles, and, flowing north-northwest around the range of the same name, turns suddenly south and discharges its waters into the Great Salt lake of the Utah Basin. Far up in the Wind River range the Green river has its sources, and receiving ten or a dozen affluents, flows southward through Northwestern Colorado and Eastern Utah to its junction with the Grand river, with which it forms the Rio Colorado of the West, and discharges its waters into the Gulf of California. In the northwest of the Territory we find the Madison and Gallatin, two of the sources of the Missouri, both rising in the Yellowstone National Park; the Yellowstone river, the largest tributary of the Missouri, rising in the Wind River Mountains, and traversing Yellowstone National Park and the Yellowstone lake; East fork, Clarke's fork, the Big Horn river and its numerous branches; the Tongue river, the Powder river and

its tributaries, all affluents of the Yellowstone; while the Little Missouri, the North fork or Belle Fourche river, and the Big Cheyenne with its forks and branches; the Eau qui Court or Niobrara and the North fork of the Platte river, which traverses half the Territory, are all affluents of the Missouri below the mouth of the Yellowstone, watering the northern, eastern and southeastern portions of the territory. All of these carry their waters to the Gulf of Mexico.

There are two lakes of considerable size, Yellowstone and Shoshone, in the Yellowstone National Park, and several of somewhat smaller dimensions, in the southern and central portions of the Territory.

Geology and Mineralogy.—The crests, and, indeed, the bulk of the mountain masses of all the ranges of the territory are eozoic, being composed mainly of red feldspathic granite and syenite and gneiss, while the lower slopes are silurian, forming narrow belts around the higher mountain slopes. To these succeed the more distinctly fossiliferous formations, Devonian, carboniferous, triassic, jurassic and cretaceous rocks, succeeding each other in regular order. Between the Big Horn and Wind River Ranges, the plateau is mainly carboniferous, triassic and jurassic, with a small tract of cretaceous groups in the centre. The elevated plains are mostly cretaceous, but overlaid with tertiary sands, gravel and drift, with occasionally extensive deposits of lignite or brown coal. The coal beds along and near the Union Pacific Railway, near Evanston, at Rockspring, from Point of Rocks to Table Rock, at Carbon Station, and, indeed, all along that road, are probably lignite, as they occur in tertiary deposits, but they differ in appearance and quality from the European lignites, containing from fifty to seventy-six per cent. of fixed carbon, and are equal to most of the best bituminous coals for all purposes of combustion. Some of them are true coking coals. They are used not only on the Union and Central Pacific Railways, but in the villages and towns on the line of those roads between Omaha and San Francisco. Recently the coal of Utah and Colorado has come in competition with them, and that of New Mexico will do so. The consumption of Wyoming coal in 1876 was

524,000 tons, and has since largely increased. But if these coal beds in Southern Wyoming are lignite, there is undoubtedly an abundance of true coal, from the coal measures of the carboniferous era, on the North fork of Platte river, above and below Fort Fetterman, at the head waters, and, indeed, along the whole line of Powder river, on the North fork or Belle Fourche river, and on the Big Cheyenne. There is also reason to believe that it will be found on the plateau between the Wind river and Big Horn Mountains.

At numerous points throughout the country there have been found petroleum springs, and wells have been sunk which have proved moderately profitable. These springs have been found on the Bear river, in the extreme southwest of the Territory, at several points on the North fork of Platte river, particularly near South Pass City, and near Fort Casper, and on the branches of the Big Cheyenne. The petroleum springs, near South Pass City, are said to yield a very large supply, and are adding materially to the freight receipts of the Union Pacific.

The precious metals are found at many points in the State, gold predominating, either in placers or in quartz veins in most cases, though in a few instances silver and gold occur together. On Crow creek, twenty miles west of Cheyenne, in the Seminole Mountains, and on the eastern slope of the Big Horn Mountains, and at some other points, silver (argentiferous galena) has been discovered in proximity to the gold. In the Bear Lodge Range, in the Black Hills, at Inyan Kara and other points in that region, in the vicinity of Laramie Peak, directly north of the North Park in Colorado, in the Sweet Water Mountains, on the Wind river, and at the sources of Crazy Woman's fork, quartz mines, yielding fair amounts of gold, as well as rich placers, have been found. Doubtless these deposits are not as rich nor as actively worked as those of some of the other States and Territories adjacent; for all of the mining enterprises of Wyoming have been but languidly pushed, either from the want of men, of means, of water, or of yield sufficient to stimulate active enterprise. The whole gold and silver production of Wyoming, which was known to have been deposited in the mints and assay offices of the United

States from the first discovery of gold and silver there to June 30, 1890, was but \$805,910.12. Doubtless considerable amounts were sent through other States and Territories, and some was not deposited; but even if we allow as much more for these contingencies, the amount would be but little more than \$125,000 per year.

Of other metals and minerals, several ores of iron, particularly hæmatite, magnetic oxide, and red oxide of superior quality, occur in immense quantities. The red oxide, at Rawlins' Springs, is used for making a mineral paint of great excellence. Copper and lead are found in paying quantities, but are not as yet developed. Near Laramie City are a cluster of lakes which yield a pure sulphate of soda, many feet in thickness; and about sixty miles north of Rawlins are two soda lakes, estimated to contain 125,000 tons of carbonate of soda of great purity. There are also soda springs near Fort Bridger and at other points in the Territory.

Sulphur deposits and sulphurous springs occur at many points. Wyoming claims that she has the finest beds of statuary marble in the United States, twenty-five miles north of Laramie, and easily accessible by way of Cooper Lake Station, on the Union Pacific Railway.

Forests, Soil and Vegetation.—The explorations of Professor Hayden and his party, and those of still later surveyors and explorers, justify the estimate that there are not less than 6,000,000 acres of arable lands, and that the grazing lands are not far from 35,000,000 acres. Most of the arable lands require irrigation for successful cultivation, but this is easily obtainable in all the lands fit for cultivation; and under its influence, even the alkaline and sage brush lands yield bountiful crops.

The grazing lands are very generally covered with buffalo grass, and even the desert lands have an abundance of the white sage brush, which, after it is touched with the frost, is preferred by cattle to almost any other food. The mountains are clothed with a thick growth of pine, spruce and hemlock trees, of large size; the foot-hills have some pine, spruce, aspen, walnut, elm, ash, box-elder, hackberry, and red cedar of smaller growth, while

the river bottoms are abundantly supplied with two species of cottonwood and thickets of willows. There are considerable tracts of alkaline lands among them. The United States Exploring Expedition, under Professor Hayden, described and named 195 species of plants, many of them peculiar to the State.

Zoölogy.—The wild animals of Wyoming are: the grizzly bear (not very common), black bear, gray wolf, prairie wolf, or coyote, badger, wolverine, otter, fisher, porcupine, mink, skunk, little ermine, buffalo, elk (more abundant in Wyoming and Colorado than anywhere else in the West), mule, or black-tailed deer, the common deer, big horn, or mountain sheep, prong horn antelope, the Rocky Mountain goat, or goat antelope, four species of hare or rabbits, four of squirrels, two of prairie dogs, gopher, muskrat, two species of mouse, etc. In all, more than thirty species of mammals have been described in the country, and 124 species of birds, including twelve or thirteen birds of prey; many game birds, including a dozen or more of the duck and teal family, six species of grouse, ptarmigan, etc., and a large number of song birds; there are more than eighty species of mollusks. Reptiles are not numerous. Trout are abundant in the mountain streams, and other fresh water food fishes are plentiful.

Climate.—The average mean temperature of the whole Territory is about 44° Fahrenheit. In the mountains it is, in some years as low as 36°, while on the plains in the east it averages 45° to 46°, and in the Green river region, in the southwest, it is about 42°. The summers are, for the most part, cool and comfortable, though in some years the temperature rises to 103° in the hottest part of the day. The nights are cool. The cold of winter is at times intense, the winds and snow sweeping over the vast plains with almost irresistible fury. The "blizzard" is a painfully familiar term in the winter months. The mercury falls from 15° to 25° below zero. Stock requires to be sheltered for two or three months, though stock-raisers too often neglect this, to their great loss. The annual rainfall ranges from 8 to 13.5 inches, and it is an objection, though not an insuperable one, to the settlement of the Territory.

Objects of Interest.—There are many of these in the State, some the results of erosion, others of volcanic action, and others still of subterraneous convulsions and chemical action in the great laboratory of nature. But the greatest wonder of all—rather the greatest collection of wonders—the Yellowstone National Park—deserves and shall have a consideration more full than can be given to it in a single paragraph, for it is unrivalled in the variety and grandeur of its attractions by any other known tract of the earth's surface. But before proceeding to portray as vividly as we may this wonderland in the heart of the continent, we must give a little space to the early history of this Territory and its natural wonders.

Historical Notes.—Wyoming Territory, and especially the Big Horn region and the country about Yellowstone lake and the sources of the Yellowstone, was probably known to the Spanish adventurers of the early part of the seventeenth century. That they were cut off by the Indians some time between 1650 and 1680 is a matter of tradition among the Mexican priests. More than a century later (in 1781), an expedition, accompanied by Jesuit missionaries, set out for this region from Santa Fé, but did not return. In 1866 the remains of an old Spanish arastra—a contrivance for crushing quartz, which has been often described—was found near Lake de Smet, in the Big Horn Mountains, and subsequently other Spanish ruins of houses and fortifications were found in the same vicinity. The more recent discoveries in Wyoming are due mainly to two men, Father Peter John de Smet, a Jesuit priest and missionary, who visited and explored much of the Territory in 1838 and 1839, and Captain James Bridger, who, with his partner, Vasquez, built a trading fort near the present site of Fort Laramie. There had been, however, a fur-trading post established in that vicinity as early as 1834, and rebuilt by the American Fur Company in 1836. Captain Bridger says, with the Western habit of humorous exaggeration, that he was there when Laramie Peak hadn't begun to grow, and was a hole in the ground (Laramie Peak being now 10,000 feet above the sea), but he probably does not much antedate 1839. Fort Bridger was held by Messrs. Bridger and Vas-

quez till 1854, when they sold it to the Mormons, who burned it in 1857, but it was rebuilt by the United States in 1858. Several forts and camps, six in all, have since been built for the protection of the Union Pacific Railway and the mining settlements. The Territory was organized by Act of Congress, approved July 25, 1868. Its growth has been slow, partly because the Indians were troublesome, and partly because the land was not as easily or successfully cultivated as in some of the other Territories. There had been no serious fighting with the Indians until 1876, when the Sioux, in the extreme northeast of the Territory, in the Black Hills, attacked General Custer's command and completely destroyed it. The Sioux have since been expelled from the Territory, and there are now only a band of the Eastern Shoshones, numbering 1,250 and partially civilized, and a smaller band of the Northern Arapahoes, numbering 900, in the Territory. These are both on the Shoshone Reservation, which contains 1,520,000 acres, with a fair proportion of tillable land, and are peaceable and quiet.

The State is deserving of a better reputation than it has had in the past, and will be found desirable for those who are disposed to engage in stock-raising or the breeding of horses; while parties who have some means can invest them very profitably in some of the rich valleys of the Big Horn or Wind River Mountains, and with a moderate irrigation can produce abundant crops, for which they will find a ready home market. The construction of railways, rendering the Yellowstone National Park readily accessible, has not only called many thousands to Wyoming, but has greatly increased the demand for agricultural products, which ought to be supplied by Wyoming farmers.

Wyoming was admitted as a State July 11, 1890. The population in 1890, of 60,705, was a threefold increase in ten years, and in the next decade the advance will be remarkable.

CHAPTER XXII.

THE YELLOWSTONE NATIONAL PARK.

THE Yellowstone National Park is a region about sixty-five miles long by fifty-five miles wide, situated mostly in the northwest corner of Wyoming Territory, but on its north and west sides stretching a few miles into the adjacent Territories of Montana and Idaho. It covers an area of about 3,578 square miles, or 2,298,920 acres, having an extent a little greater than that of the combined States of Rhode Island and Delaware. In this region there are assembled so many grand, sublime and picturesque natural objects, and such a variety of unique and marvellous phenomena, that when an account of some of the most remarkable of these wonders was brought before Congress in the report of the United States Geological Survey, under Professor Hayden, an act was passed by the unanimous vote of both Houses, and approved by the President, March 1, 1872, withdrawing from sale and occupancy, and setting apart as a National Park, or perpetual public pleasure ground, for the use and enjoyment of the people, the area above described, with boundaries designed to include the chief wonders of the region, and described as follows: "Commencing at the junction of Gardiner's river with the Yellowstone river, and running east to the meridian passing ten miles to the eastward of the most eastern point of Yellowstone lake; thence south along said meridian to the parallel of latitude passing ten miles south of the most southerly point of Yellowstone lake; thence west along said parallel to the meridian passing fifteen miles west of the most western point of Madison lake; thence north along said meridian to the latitude of the junction of the

Yellowstone and Gardiner's rivers ; thence east to the place of beginning."

The region, thus bounded, stretches a few miles east of the meridian of 110° , and about as far west of the meridian of 111° west longitude from Greenwich, and a few miles north of the parallel of 45° , and not quite so far south as 44° north latitude. These boundaries show at once that this National Park is not like the parks of Colorado, which are strictly natural divisions of land, being great areas, level or slightly undulating, enclosed by a rim of lofty mountains, whereas the boundaries of the National Park are purely artificial, merely referring to certain natural objects for their location.

"Situated," says Professor William I. Marshall, who has made this great wonderland a special subject of study, "along the highest part of that great culminating area of North America which has been aptly termed 'The Crown of the Continent,' and from which pour down to the Gulf of Mexico on the southeast, to the Gulf of California on the southwest, and to the open Pacific on the northwest, the mightiest rivers of both coasts of the continent, the Park embraces within its boundaries, on the west side of the main range of the Rocky Mountains, the country about some of the headwaters of the Lewis or Snake river, the great southerly fork of the Oregon or Columbia, the greatest river of the Pacific slope, which no longer

" ' Hears no sound
Save its own dashings,'

since the steamer's wheels now vex its waters, the hum of varied industry rises from its fertile valleys, and the roar of the railroad startles the echoes along its dales. Most of the Park, however, is on the east side of the main range, and embraces the country about the headwaters of the Madison and Gallatin rivers, which are the middle and eastern of the three streams which unite to form the Missouri river, and much of the upper valley, though not the extreme headwaters of the Yellowstone river, which is a stream as long as the Rhine or the Ohio, far surpasses them in the sublimity of its scenery, and is the greatest tributary of the upper part of the Missouri river.

"Being a volcanic region, the Park (except a little of the north-east corner of it, where silver mines exist) is valueless for mining purposes, except for sulphur, and as that exists in unlimited quantities at points nearer the main line of the Union Pacific, notably at a point forty miles southeast of Evanston, the extra freight on it will make the Park deposit economically valueless. As the lowest valleys of the Park are more than 6,000 and most of them from 7,000 to 8,000 feet above the sea, its altitude and latitude make it worthless for farming purposes, there being few nights without frosts. Though not adapted for a permanent residence of any considerable population, the Park, with its opportunities for sailing, and rowing, and fishing, and hunting, with the grandest of mountains within it and upon its borders, and the purest of air ever sweeping over it, and with the inducements to open air life and exercise offered by its unique and enchanting scenery, is pre-eminently fitted for a public pleasure ground, from June to October, and especially from about the first of August to the middle of October. Though a volcanic region, there is nowhere in the Park any opening from which flame, smoke, ashes or lava issues now, or, as far as known, has issued for ages past, the only manifestations of the volcanic forces now being limited to eruptions of steam and hot water; though almost everywhere in the Park, and outside its boundaries in many directions, are vast beds and streams of ancient lava, showing how terrific was the former intensity of the volcanic forces, whose declining activity now only suffices to produce steam and spout boiling water, instead, as anciently, of melting down into indistinguishable ruin the adamantine framework of the continent, and spreading it, as a foaming torrent of fiery devastation, over the surface of mountains and plains for an area of scores of thousands of square miles."

The Park is not readily accessible from Wyoming; on its eastern side the Wind River Range presents an impassable barrier of lofty walls of rock, through which none of the exploring parties have ever been able to find a practicable pass even for pack animals; on the southern side a stage road extends from Green River City to Camp Brown, a distance of 155 miles; thence a tolerable wagon road exists to the head of Wind river, a distance

of 110 miles more ; but from thence to Yellowstone lake, a distance of fifty miles, is a difficult trail, which can be traversed only on foot with pack animals and with considerable danger. On the west side, by way of the Union Pacific extension north from Ogden to Garrison (Northern Pacific). At the proper alighting place is a wagon road to the Upper Geyser and the Park roads. On these run the daily stage, though the circuit takes usually five days for a good view of the sights. The preferred route is to Livingston by the Northern Pacific, as its branch to Cinnabar is at the edge of the National Pleasure-grounds. The large hotel at Mammoth Springs accommodates some hundreds of guests. At other points on the stage road are houses for tourists, all governed by the Park Association under United States Army franchises. The charges for guides, horses, etc., are fixed, and the most modern appliances, such as the telegraph, are at hand in the heart of this wild wonderland.

It should be said that that portion of the Park lying east of the Yellowstone river and lake is so rough and mountainous and possesses so few attractions, that it is not often visited. The lofty mountain chain which extends from the southeastern arm of Yellowstone lake to Slough creek and the Tower creek falls of the Yellowstone, has but a single and very difficult pass over it.

The elevated plateau enclosed between this mountain range and the Yellowstone lake and river affords a fine pasture-ground for the elk, black buffalo, deer, bighorns and moose, which, on the other side of the Park, are so ruthlessly slaughtered by wanton tourists, and after being deprived of their skins, antlers, or horns, and tongues, are left to be the prey of wolves, panthers and coyotes. Amid these lofty pasture-grounds specimens at least of our great game animals might be kept. In the extreme northeast corner of the Park, on Clark's fork of the Yellowstone, are some mines of gold and perhaps silver, which might better be ceded to the miners than suffered to encroach on the Park.

The attractive features of the Park are all on the west side of the Yellowstone river, and west of the east or southeast shores of the Yellowstone lake. Approaching the Park from the north, from

Bozeman and Boteler's Rancho, the road passes first along what is called outside the Park the Upper Cañon of the Yellowstone, a narrow passage of that river between perpendicular, rocky walls, from 2,000 to 3,000 feet in height. This extends for about three miles. Ten miles farther on, Cinnabar Mountain, so called from its surface of brilliant red clay (the color being due, however, to red ochre and not to cinnabar), is passed, with its immense "Devil's Slide," a huge stone trough, which extends to its summit, with smooth, dark, nearly vertical parallel walls, thirty feet apart and 200 feet in height. A short distance beyond this we enter the Park, passing between Sepulchre Mountain, the northern terminal mountain of the Upper Madison Range, on the right hand, looking south, and the cañon of Gardiner's river, an affluent of the Yellowstone, which here has a course nearly west by south, through deeply worn banks. Shortly after leaving Sepulchre Mountain we come to a terraced hill, quite steep and of various colors, in which are situated the Mammoth Hot Springs, whose wonderful forms and character we will allow an eye-witness to describe presently. Crossing at the foot of these terraces the Gardiner river at the point where its cañon commences, we ride along by the side of a succession of cascades of one of its eastern affluents, and striking due east, at a distance of twenty miles, reach Barronette's bridge over the Yellowstone, and a little above, just where the Yellowstone emerges from its Grand Cañon, Tower creek comes in from the west, plunging down 156 feet, and within the next two hundred yards by a succession of rapids leaping into a dark and dismal gorge, 260 feet in depth. Basaltic tufa cones and columns, in the form of towers, turrets, pinnacles and cathedrals, in the vicinity of the falls, have suggested its name. At these falls the Grand Cañon of the Yellowstone, twenty miles in length, and one of the great wonders of the Park, terminates. Southward from the Tower falls commences the long, rolling, and somewhat difficult ascent to Mount Washburn, the Pisgah of the Park, from the summit of which can be seen, in near or distant view, all its glories. Descending from the mountain, the trail takes us again to the Yellowstone and to the great falls which precede its plunge into the Great Cañon. Reserving

a description of these for the poetic language of an eye-witness, we follow the course of the river to Sulphur Mountain, with its boiling springs of sulphuretted water, then four miles farther to the Mud Volcano, or Mud Geysers, spouting springs, which throw up mal-odorous mud instead of water, and one of which, from its preternatural activity, is named "The Devil's Workshop." Eight miles farther on, we reach the northern extremity of the beautiful Yellowstone lake, at the point where the Yellowstone river leaves it. This lake, the surface of which is 7,788 feet above the sea, is twenty-two miles in its greatest length, and about fifteen miles in width, and has a shore line of more than 300 miles, from its very irregular form. There are a number of islands in it, and its beauty is too great for description. To comprehend its loveliness several days should be spent in camping on its borders. From this lake we may take either of two trails, the one going nearly south, past the Geysers of the Yellowstone lake, on the east side of the great divide of the Rocky Mountains, and across a spur of that divide to Heart lake, at the foot of Mount Sheridan, where there are other geysers, and thence by a new trail westward past Lewis lake and Shoshone lake, where there are more geysers and a lake four feet higher than the Yellowstone, and thence northward by a difficult pass over the Rocky Mountains to the Upper Geyser basin, on the Upper Madison river, from which point there is a good road (the Norris road) to the Midway Springs and the Lower Geyser basin, on the Fire Hole river. Or, we may go from the geysers on the Yellowstone lake by a shorter though difficult trail directly west to the Upper Geyser basin, without visiting Heart, Lewis and Shoshone lakes. From this Upper Geyser basin we pass by the Norris road, as we have said, to the Midway Springs, the Lower Geyser basin, in the Fire Hole river, the Gibbon's Fire Hole basin and geysers on the Howard road, the falls and cañon of Gibbon's fork, the Monument Geyser basin, the Norris and Fire Hole basins, of geysers and craters of spent volcanoes, the remarkable formation of Pine and Beaver lakes, the Obsidian or volcanic glass cliffs, and the road of glass over them, and so back to the Mammoth Hot Springs at the entrance to the Park.

We have purposely avoided in this mere itinerary any description of these wonders, that we might do them better justice in the vivid portrayal of eye-witnesses. The tour of the Park thus described covers 164 miles, and cannot well be gone over in less than twelve days.

Turning now to these various points of interest, let us go over them in detail, using the descriptions of those who have studied them most thoroughly, and been most deeply impressed with their grandeur and beauty.

Let us begin with a description of the Mammoth Hot Springs of Gardiner river, from the facile and skilful pen of Robert E. Strahorn, Esq.: "The first impression of these Springs which the beholder receives is that of a snowy mountain beautifully terraced, with projections extending out in various directions, resembling frozen cascades, as though the high, foam-crested waves, in their rapid descent over the steep and rugged declivity, were suddenly arrested and congealed on the spot in all their native beauty. There are fifty or sixty of these springs of greater and smaller dimensions, extending over an area of about a mile square; though there are remains of springs of the same kind for miles around, and mountains of the same deposit, overgrown with pine trees, perhaps hundreds of years old. Most of the water is at boiling heat, and contains in solution a great amount of lime, sulphur and magnesia, with some soda, alumina and other substances, which are slowly deposited in every conceivable form and shape as the water flows along in its course down the mountain side.

"On each level, or terrace, there is a large central spring, which is usually surrounded by a basin of several feet in diameter, and the water, after leaving the main basin at different portions of the delicately-wrought rim, flows down the declivity, step by step, forming hundreds of basins and reservoirs of every size and depth, from a few inches to six or eight feet in diameter, and from one inch to several feet in depth, their margins beautifully scalloped with a finish resembling bead-work of exquisite beauty. Underneath the sides of many of the basins are beautifully arranged stalactites, formed by the dripping of the water; and, by

digging beneath the surface at places where the springs are inactive, the most delicate and charming specimens of every character and form can be obtained—stalactites, stalagmites, grottos, etc., all delicately arranged as the water filtrates through the crevices and perforations of the deposit. It is a scene sublime in itself, to see the entire area, with its numerous and terraced reservoirs, and millions of delicate little urns, sparkling with water transparent as glass, and tinged with many varieties of coloring, all glistening under the glare of a noonday sun.

“The largest spring now active, situated about half way up the mountain on the outer edge of the main terrace, has a basin about twenty-five by forty feet in diameter, in the centre of which the water boils up several inches above the surface, and is so transparent that you can, by approaching the margin, look down into the heated depths many feet below the surface. The sides of the cavern are ornamented with a coral-like formation of almost every variety of shade, with a fine, silky substance, much like moss, of a bright vegetable green spread over it thinly, which, with the slight ebullition of the water keeping it in constant motion, and the blue sky reflected in the transparent depths, gives it an enchanting beauty far beyond the skill of the finest artist. Here all the hues of the rainbow are seen and arranged so gorgeously that, with other strange views by which one is surrounded, you almost imagine yourself in some fairy region, the wonders of which baffle all attempts of pen or pencil to portray them.

“Besides the elegant sculpturing of this deposit, imagine, if you can, the wonderful variety of delicate and artistically arranged colors with which it is adorned. The mineral-charged fluid lays down pavements here and there of all the shades of red, from bright scarlet to rose tint, beautiful layers of bright sulphur-yellow, interspersed with tints of green, all elaborately arranged in Nature's own order.

“At the foot of the mountain are several springs whose waters have effected remarkable cures in cases of chronic rheumatism, eruptive diseases, etc. The medicinal properties of each fountain seem to be different, and the invalid can find which are best adapted to his or her own case.”

On leaving the Hot Springs to make the circuit of the Park, the favorite course is that leading eastward to the Yellowstone Cañon. The route passes up Gardiner's river, with its three falls, through a pleasant country, twenty-two miles, to Tower creek, a rapid, snow-fed brook, twelve or fifteen feet wide, and one or two feet deep, which here joins the Yellowstone. Tower creek rises in the high divide between the valleys of the Missouri and Yellowstone, and flows for about ten miles through a cañon so deep and gloomy that it has earned the appellation of the "Devil's Den." About two hundred yards above its entrance into the Yellowstone, the stream pours over an abrupt descent of 156 feet, forming one of the most beautiful falls to be found in any country. These falls are about 260 feet above the level of the Yellowstone at the junction, and are surrounded with columns of volcanic breccia, rising fifty feet above the falls, and extending down to the foot, standing like gloomy sentinels, or like gigantic pillars, at the entrance of some grand temple. Of these columns the late Hon. N. P. Langford, the first superintendent and historian of the Park, said: "Some resemble towers, others the spires of churches, and others still shoot up as little and slender as the minarets of a mosque. Some of the loftiest of these formations, standing upon the very brink of the fall, are accessible to an expert and adventurous climber. The position attained on one of these narrow summits, amid the uproar of waters, and at a height of 260 feet above the boiling chasm, as the writer can affirm, requires a steady head and strong nerves; yet the view which rewards the temerity of the exploit is full of compensations." Below the fall the stream descends in numerous rapids with frightful velocity, through a gloomy gorge, to its union with the Yellowstone. Its bed is filled with enormous boulders, against which the rushing waters break with great fury. Many of the capricious formations wrought from the shale excite merriment as well as wonder. Of this kind, especially, is a huge mass, sixty feet in height, which, from its supposed resemblance to the proverbial foot of his Satanic Majesty, is called the "Devil's Hoof." The scenery of mountain, rock and forest surrounding the falls is very beautiful. The name of "Tower Falls" was, of



FALLS OF THE YELLOWSTONE—*Geysers of the Yellowstone).*

course, suggested by some of the most conspicuous features of the scenery. The sides of the chasm are worn into caverns, lined with variously tinted mosses, nourished by clouds of spray which rise from the cataract; while above and to the left, a spur from the great plateau rises over all with a perpendicular front of 400 feet.

"Nothing," says Lieutenant Doane, "can be more chastely beautiful than this lovely cascade, hidden away in the dim light of overshadowing rocks and woods, its very voice hushed to a low murmur, unheard at the distance of a few hundred yards. Thousands might pass by within a half mile and not dream of its existence; but once seen, it passes to the list of most pleasant memories."

A fine view of Tower falls can be had from an easily ascended cliff above them, but a better one, a prospect that is simply enchanting, can be obtained by walking down to the mouth of Tower creek, 200 yards, and following up stream, through the beautiful gateway, to their foot. Two hundred yards above the falls is a finely sheltered, picturesque camp, with grass, wood and water abundant.

From Tower creek and falls we have a choice between two routes, one leading along the western bank of the Yellowstone river, and overlooking the Grand Cañon for twenty miles, the other ascending by a long and wearisome climb the northern slope of Mount Washburn, 10,388 feet above the sea, from whose summit all the points of interest in the Park can be discerned with a good field-glass in the clear and transparent summer air. Most visitors prefer this ascent first, as giving them a more comprehensive idea of the magnificence of the Park. We will follow their example, in imagination at least, and will allow Rev. Wayland Hoyt, D. D., of Brooklyn, who visited the Park in 1878 in General Miles' party, to describe to us the glorious vision: *

"Let us take our stand for a little now upon Mount Washburn. Its rounded crest is more than 10,000 feet above the level

* This glowing picture of the view from Mount Washburn, as well as some other eloquent passages farther on, are copied, by the kind permission of the author, from an address on the Yellowstone Park, which Dr. Hoyt prepared after his return, but which is as yet unpublished.

of the sea, and perhaps 5,000 feet above the level of the valley out of which it springs. Its smooth slopes are easy of ascent. You need not dismount from your horse to gain its summit. Standing there you look down upon the whole grand panorama, as does that eagle yonder, holding himself aloft upon almost motionless wings. I doubt if there is another view at once so majestic and so beautiful in the whole world. Your vision darts through the spaces for 150 miles on some sides. You are standing upon a mountain lifting itself out of a vast saucer-shaped depression. Away yonder, where the sky seems to meet the earth, on every side, around the whole circumference of your sight, are lines and ranges of snow-capped peaks shutting your glances in. Yonder shoots upward the serrated peak of Pilot Mountain, in the Clark's Fork Range. Joined to that, sweep on around you, in the dim distance, the snowy lines of the Madison Range. Yonder join hands with these the Stinking Water Mountains, and so on and on and around. Do you see that sharp, pinnacle-pointed mountain, away off at the southwest, shining, in its garments of white, against the blue of the summer sky?—that is Mount Everts, named after the poor lost wanderer, who for thirty-seven days of deadly peril and starvation sought a way of escape from these frowning mountain barriers, which shut him in so remorselessly, and it marks the divide of the continent.

“Take now a closer view for a moment. Mark the lower hills, folded in their thick draperies of pine and spruce like dark green velvet, of the softest and the deepest; notice, too, those beautiful park-like spaces, where the trees refuse to grow, and where the prairie spreads its smooth sward freely toward the sunlight. And—those spots of steam, breaking into the vision every now and then, and floating off like the whitest clouds that ever graced the summer sky—those are the signals of the geysers at their strange duty, yonder in the geyser basins, thirty miles away. And—those bits of silver, flashing hither and thither on the hill-sides amid the dense green of the forests—these are waterfalls and fragments of ice-glaciers, which for ages have been at *their* duty of sculpturing these mountains, and have not yet completed it. And—that lovely deep blue sheet of water, of such a dainty

shape, running its arms out toward the hills, and bearing on its serene bosom emeralds of islands—that is the sweetest sheet of water in the world—that is the Yellowstone lake. And—that exquisite broad sheen of silver, winding through the green of the trees and the brown of the prairie—that is the Yellowstone river, starting on its wonderful journey to the Missouri, and thence downward to the gulf, between six and seven thousand miles away. But, nearer to us, almost at our feet, as we trace this broad line of silver, the eye encounters a frightful chasm, as if the earth had suddenly sunk away, and into its gloomy depths the brightness and beauty of the shining river leaps, and is thenceforward lost altogether to the view—*that* is the tremendous cañon or gorge of the Yellowstone.”

Contrary to the Latin adage, “*Facilis descensus Averni*,” the descent from Mount Washburn to the Grand Cañon of the Yellowstone is one of considerable difficulty by the old trail; but by a new one traced by Mr. P. W. Norris, the present superintendent of the Park, it is much easier. The old trail, more than twenty miles in length, followed the Washburn Range at a considerable distance from the river, through tangled forest and along rocky and precipitous passes, to the upper and lower falls of the Yellowstone, just where Cascade creek discharges its waters into the river. This is above the Grand Cañon, or, rather, at the point where it commences; for these two falls, the upper of about 150 feet, and the lower of 350 feet, with the rapids which follow, constitute a part of the tremendous depth to which the Grand Cañon sinks, and which it maintains to the point of emergence at Tower creek falls, twenty miles below. At one or two points near its lower terminus daring and adventurous spirits have reached the floor of the cañon, but have found it extremely perilous and difficult to clamber out of it; they describe it as having its full share of disagreeable sounds, sights and smells, from the great number of hot springs of sulphur, sulphate of copper, alum, etc. The water is warm and impregnated with a villanous taste of alum and sulphur, and along the dark margin of the river are numerous chemical and corrosive springs, some depositing craters of calcareous rock, and some casting up vol-

umes of mud or muddy waters. The greater part of the Grand Cañon, however, and especially its upper two-thirds, had always been regarded as entirely inaccessible, till the summer of 1878, when Messrs. Hoyt and Rouse, of Cleveland, Ohio, succeeded at the imminent peril of their lives, in descending to it, a little below the Great falls. They describe it as fearfully gloomy and uncanny. Rev. Dr. Hoyt and his party took the old trail and approached the river at the mouth of Cascade creek, between the upper and lower or Great falls, at the point where they could look down into the Grand Cañon at the place of its greatest magnificence, and of the many descriptions of this great wonder of the world, that which he has given may justly be esteemed the most graphic and beautiful. It is as follows:

"Well, we have reached Cascade creek at last; and a beautiful grove of trees, beneath whose shade sparkles a clear stream, whose waters are free from the nauseous taste of alkali, furnishes a delightful place in which to camp. Now—dismounting and seeing that your horse is well cared for, while the men are unloading the pack-mules and pitching the tents—walk up that trail, winding up that hillside; follow it for a little among the solemn pines, and then pass out from the tree-shadows, and take your stand upon that jutting rock—clinging to it well meanwhile, and being very sure of your footing, for your head will surely grow dizzy—and there opens before you one of the most stupendous scenes in Nature—THE LOWER FALLS AND THE AWFUL CANON OF THE YELLOWSTONE.

"And now, where shall I begin, and how shall I, in any wise, describe this tremendous sight—its overpowering grandeur, and at the same time its inexpressible beauty?

"Look yonder—those are the lower falls of the Yellowstone. They are not the grandest in the world, but there are none more beautiful. There is not the breadth and dash of Niagara, nor is there the enormous depth of leap of some of the waterfalls of the Yosemite. But here is majesty of its own kind, and beauty, too. On either side are vast pinnacles of sculptured rock. There, where the rock opens for the river, its waters are compressed from a width of 200 feet, between the upper and

lower falls, to 150 where it takes the plunge. The shelf of rock over which it leaps is absolutely level. The water seems to wait a moment on its verge; then it passes with a single bound of 350 feet into the gorge below. It is a sheer, unbroken, compact, shining mass of silver foam.

"But your eyes are all the time distracted from the fall itself, great and beautiful as it is, to its marvellous setting—to the surprising, overmastering cañon into which the river leaps, and through which it flows, dwindling to but a foamy ribbon there in its appalling depths.

"As you cling here to this jutting rock, the falls are already many hundred feet below you. The falls unroll their whiteness down amid the cañon glooms. Hold firmly on, and peer over the rock to which you cling and gaze down; that apparently narrow stream is the large river flowing nearly 2,000 feet below you; it is sheer that distance; these rocky sides are almost perpendicular—indeed in many places the boiling springs have gouged them out so as to leave overhanging cliffs and tables at the top. Take a stone and throw it over—you must wait long before you hear it strike. Nothing more awful have I ever seen than the yawning of that chasm. And the stillness, solemn as midnight, profound as death! The water dashing there as in a kind of agony against those rocks, you cannot hear. The mighty distance lays the finger of its silence on its white lips. You are oppressed with a sense of danger. It is as though the vastness would soon force you from the rock to which you cling. The silence, the sheer depth, the gloom burden you. It is a relief to feel the firm earth beneath your feet again, as you carefully crawl back from your perching place.

"But this is not all, nor is the half yet told. As soon as you can stand it, go out on that jutting rock again, and mark the sculpturings of God upon those vast and solemn walls. By dash of wind and wave, by forces of the frost, by file of snow plunge and glacier and mountain torrent, by the hot breath of boiling springs, those walls have been cut into the most various and surprising shapes. I have seen the middle age castles along the Rhine; there, those castles are reproduced exactly. I have seen

the soaring summits of the great cathedral spires, in the country beyond the sea; there they stand in prototype, only loftier and sublimer.

"And then, of course and almost beyond all else, you are fascinated by the magnificence and utter opulence of color. Those are not simply gray and hoary depths and reaches, and domes and pinnacles of sullen rock. The whole gorge flames. It is as though rainbows had fallen out of the sky and hung themselves there like glorious banners. The underlying color is the clearest yellow; this flushes onward into orange. Down at the base the deepest mosses unroll their draperies of the most vivid green; browns, sweet and soft, do their blending; white rocks stand spectral; turrets of rock shoot up as crimson as though they were drenched through with blood. It is a wilderness of color. It is impossible that even the pencil of an artist tell it. What you would call, accustomed to the softer tints of nature, a great exaggeration, would be the utmost tameness compared with the reality. It is as though the most glorious sunset you ever saw had been caught and held upon that resplendent, awful gorge!

"Through nearly all the hours of that afternoon, until the sunset shadows came, and afterwards amid the moonbeams, I waited there, clinging to that rock, jutting out into that overpowering, gorgeous chasm. I was appalled and fascinated, afraid and yet compelled to cling there. It was an epoch in my life."

But we must hasten forward. The trail above the upper falls follows closely the right or west bank of the Yellowstone to the Yellowstone lake, a distance of eighteen or nineteen miles. On the way Sulphur Mountain is passed on the right, and the Sulphur Hills on the left, east of the river, though neither of them are more sulphurous than many other hills and mounds in the Park. Eleven miles from the Great Falls is the Mud Volcano, an interesting though somewhat dirty object. Eight miles more bring the traveller to the Yellowstone lake, one of the most beautiful sheets of water in "Our Western Empire," and hardly surpassed in beauty by any lake on our globe. It is twenty-two miles in length, and from twelve to fifteen in breadth.

We shall not attempt in this place any explanation of the philosophy of the geyser, for two reasons : one, that scientists are not agreed in their views of it ; the only thing fully ascertained in regard to it is that the hot water passes up through long tubes or pipes of different diameters ; and the other, that their explanations are too abstruse to be understood by the masses.

We will, then, turn to a contemplation of the geysers, and especially of those of the Upper Geyser Basin, where, though somewhat fewer in number than in the Lower basin, they are of much greater power and magnificence. And, first, let us follow Rev. Edwin Stanley, a visitor to the Park, whose " Rambles in Wonderland," gives a very interesting account of this Upper basin, as he marshals the geysers in a grand parade :

" Let us imagine ourselves for once standing in a central position, where we can see every geyser in the basin. It is an extra occasion, and they are all out on parade, and all playing at once. There is good Old Faithful, always ready for her part, doing her best—the two by five feet column playing to a height of 150 feet—perfect in all the elements of geyser action. Yonder the Beehive is sending up its graceful column 200 feet heavenward, while the Giantess is just in the humor, and is making a gorgeous display of its, say, ten feet volume to an altitude of 250 feet. In the meantime the old Castle answers the summons, and putting on its strength with alarming detonations is belching forth a gigantic volume seventy feet above its crater; while over there, just above the Saw-mill, which is rallying all its force to the exhibition, rustling about and spurting upward its six-inch jet with as much self-importance as if it were the only geyser in the basin, we see the Grand, by a more than ordinary effort, overtopping all the rest, with its heaven-ascending, graceful volume, 300 feet in the air. Just below here the Riverside, the Comet, the complicated and fascinating Fantail, and the curiously-wrought Grotto, are all chiming in, and the grand old Giant, the chief of the basin, not to be left behind, or by any one outdone, is towering up with its six feet fountain, swaying in the bright sunlight at an elevation of 250 feet. In the meantime a hundred others of lesser note, we will say, are answering the call at this grand exposition, and

coming out in all their native glory and surpassing beauty. Just listen to the terrible, awful rumblings and deafening thunders, as if the very earth would be moved from its foundation—the thousand reports of rushing waters and hissing steam, while Pluto is mustering all his forces, and Hades would feign disgorge itself and submerge our world. But then look upward at the immense masses of rising steam ascending higher and still higher, until lost in the heavens above ; while every column is tinselled over with a robe of silver decked with all the prismatic colors, and every majestic fountain is encircled with a halo of gorgeous hues.”

As a matter of fact, however, the geysers are never all in action at the same time. Their periods of activity are different at different times, and with some of them are at increasingly long intervals, and probably they will eventually cease to act, as so many others have done. New geysers are constantly forming, and may take the places of the silent ones. Some of the most remarkable of the number are so uncertain that parties have remained at the basins for two or three weeks without witnessing their action, and again perhaps soon after they have sent up a magnificent column twice or thrice in twenty-four hours. One explorer, Lieutenant Barlow, tells us that near the edge of the basin, where the river makes a sharp bend to the southeast, is found the initial geyser—a small steam vent—on the right. Soon on either side of the river are seen the two lively geysers, called the “Sentinels,” because of their nearness to the gate of the great geyser basins. The one on the left is in constant agitation, the waters revolving horizontally with great violence, and occasionally spouting upward to the height of twenty feet, the lateral direction being fifty feet. Enormous masses of steam are ejected. The crater of this is three feet by ten. The opposite Sentinel is not so constantly active, and is smaller. About 250 yards from the gate are three geysers acting in concert. When in full action the display from these is very fine. The waters spread out in the shape of a fan, in consequence of which they have been named the Fan Geysers. One hundred yards farther up the side of the stream is found a double geyser, a

stream from one of its orifices playing to the height of eighty or ninety feet, emitting large volumes of steam. From the formation of its crater it was named the Well Geyser.

Still above are found some of the most interesting and beautiful geysers of the whole basin. First are two smaller geysers near a large spring of blue water, while a few yards beyond are seen the walls and arches of the Grotto. This is an exceedingly intricate formation, eight feet in height and ninety in circumference. It is by many called the gem of all the geysers. It is absolutely magnificent—a sight of resplendent beauty, that greets the eyes nowhere outside of the region of the National Park. It is simply a miniature temple of alabaster whiteness, with arches leading to some interior Holy of Holies, whose sacred places may never be profaned by eye or foot. The hard calcareous formation about it is smooth, and bright as a clean swept pavement. Several columns of purest white rise to a height of eight to ten feet, supporting a roof that covers the entire vent, forming fantastic arches and entrances, out of which the water is ejected during an eruption fifty or sixty feet. The entire surface is composed of the most delicate bead-work imaginable, white as the driven snow, massive but elaborately elegant, and so peerlessly beautiful that the hand of desecration has not been laid upon it, and it stands without flaw or break in all its primal beauty—a grotto of pearls, “the beautiful princess of all the realm.”

Proceeding 150 yards farther, and passing two hot springs, a remarkable group of geysers is discovered. One of these has a huge crater, five feet in diameter, shaped something like the base of a horn—one side broken down—the highest point being fifteen feet above the mound on which it stands. This proved to be a tremendous geyser, which has been called the Giant. It throws a column of water the size of the opening to the measured altitude of 130 feet, and continues the display for an hour and a half. The amount of water discharged is immense, almost equal in quantity to that in the river, the volume of which during the eruption is doubled. But one eruption of this geyser was observed. Another large crater close by has several orifices, and with ten small jets surrounding it, formed probably one connecting system. The hill built up by this group covers an acre of ground, and is thirty feet in height.

Near the middle of the Upper Geyser basin is the "Grand Geyser," the most remarkable in many respects in the world. Lieutenant Doane, U. S. A., who spent several days in its immediate vicinity in 1877, thus describes it: "Opposite camp, on the other side of Fire Hole river, is a high ledge of stalagmite, sloping from the base of the mountain down to the river. Numerous small knolls are scattered over its surface, the craters of boiling springs, from fifteen to twenty-five feet in diameter; some of these throw water to the height of three and four feet. On the summit of this bank of rock is *the grand geyser of the world*, a well in the strata, twenty by twenty-five feet in diametric measurements (the perceptible elevation of the rim being but a few inches), and when quiet having a visible depth of 100 feet. The edge of the basin is bounded by a heavy fringe of rock, and stalagmite in solid layers is deposited by the overflowing waters. When an eruption is about to occur, the basin gradually fills with boiling water to within a few feet of the surface, then suddenly, with heavy concussions, immense clouds of steam rise to the height of 500 feet, and the whole great body of water, twenty by twenty-five feet, ascends in one gigantic column to the height of ninety feet; from the apex of this column five great jets shoot up, radiating slightly from each other, to the unparalleled altitude of 250 feet from the ground. The earth trembles under the descending deluge from this vast fountain; a thousand hissing sounds are heard in the air; rainbows encircle the summits of the jets with a halo of celestial glory. The falling water plows up and bears away the shelly strata, and a seething flood pours down the slope and into the river. It is the grandest, the most majestic, and most terrible fountain in the world. After playing thus for twenty minutes, it gradually subsides, the water lowers into the crater out of sight, the steam ceases to escape, and all is quiet. This grand geyser played three times in the afternoon, but appears to be irregular in its periods, as we did not see it in eruption again while in the valley. Its waters are of a deep ultramarine color, clear and beautiful. The waving to and fro of the gigantic fountain, in a bright sunlight, when its jets are at their highest, affords a spectacle of wonder of which any descrip-

tion can give but a feeble idea. Our whole party were wild with enthusiasm ; many declared it was 300 feet in height ; but I have kept, in the figures as set down above, within the limits of absolute certainty."

"In some of the elements of beauty and interest," says Professor R. W. Raymond, "the Lower Geyser basin is superior to its more startling rival. It is broader and more easily surveyed as a whole ; and its springs are more numerous, though not so powerful. Nothing can be lovelier than the sight, at sunrise, of the white steam-column, tinged with rosy morning, ascending against the background of the dark pine woods and the clear sky above. The variety in form and character of these springs is quite remarkable. A few of them make faint deposits of sulphur, though the greater number appear to be purely silicious. One very large basin (forty by sixty feet) is filled with the most beautiful slime, varying in tint from white to pink, which blobs and spits away, trying to boil, like a heavy theologian forcing a laugh to please a friend in spite of his natural specific gravity. . . . The *laugs* or extinct geysers are the most beautiful objects of all. Around their borders the white incrustations form quaint arabesques and ornamental bosses, resembling petrified vegetable growths. The sides of the reservoir are corrugated and indented fancifully, like the recesses and branching passages of a fairy cavern. The water is brightly but not deeply blue. Over its surface curls a light vapor ; through its crystal clearness one may gaze, apparently, to unfathomable depths ; and, seen through this wondrous medium, the white walls seem like silver, ribbed and crusted with pearl. When the sun strikes across the scene, the last touch of unexpected beauty is added. The projected shadow of the decorated edge reveals by contrast new glories in the depths ; every ripple on the surface makes marvellous play of tint and shade on the pearly bottom. One half-expects to see a lovely naiad emerge with floating grace from her fantastically carven covert, and gayly kiss her snowy hand through the blue wave.

"In one of these *laugs* the whitened skeleton of a mountain

buffalo was discovered. By whatever accident he met his fate there, no king or saint was ever more magnificently entombed. Not the shrine of St. Antony of Padua with its white marbles and its silver lamps, is so resplendent as this sepulcher in the wilderness."

Yet Geyserdom is not a paradise. "The Geyser basins in themselves," says Rev. Dr. Hoyt, "are very ghastly places. Save the jeweled cups, and the upward plunge of the white water, there is little beauty in them that we should desire them. Where the geysers spurt up their hot and hissing waves, and scatter them about, and then deposit as the scattered waters cool, the lime, and magnesia, and sulphur, with which they are charged, nothing green can grow. The aspect is that of a desert, except only that the sand instead of being brown is white. It seems more like a place of death than life—your horse's feet are scalded in the hot streams—you must be very careful where you tread, lest the thin crust break beneath you, and let you down into the boiling pools, and sudden death below. The air is stenchful with the breath of noxious gases. Flowers do not bloom; grass cannot spread its greenness; trees, if they come within the circle of the geyser action, stand bleached, leafless, lifeless. It is the terrible side of nature which you see."

Turning our faces northward we follow the Firehole or Upper Madison river for four or five miles from the Lower Geyser basin, till at a point opposite a forty foot fall of the river we enter upon the New Norris road, constructed by Superintendent Norris in 1878, which leads to new wonders of various kinds. The Gibbon's fork of the Firehole or Madison river, which has its source in or near Beaver lake, in the upper Madison Range, from its source to its mouth abounds in geysers, hot-springs, and fumaroles. These are not only found on its banks, in its cañons, and in the vicinity of its numerous water-falls, but along the slopes of the mountains adjacent there are four or five of these Geyser basins. The southernmost of these, near the mouth of the fork known as Gibbon's Firehole Basin, is on the Howard road.

OKLAHOMA TERRITORY.—Until of recent years, the paternal Government displayed censurable carelessness about the public lands of the regions inaccessible before the railroads reached them. But the complaints from intending homesteaders at last overcame the barrier of speculators, and their clamor led to active progress in liberating tillable tracts from the indolence of the savages and apathy of those who expected the natural increment of value to enrich their heirs.

In 1869 and earlier, much bad blood was engendered by the slaying of settlers on the Indian Territory border and after the war which punished the savages, the demand for their unused land became irresistible. Anticipating the throwing open of these acres for settlement, thousands of pioneers encamped with families and teams on the southern Kansas border and under experienced leaders, made descents upon the track called "Oklahoma." The word, of aboriginal origin, signifies "Beautiful Land," and explains the land hunger of the boomers.

But almost immediately, before log cabins were erected or the plow driven in a long furrow, the U. S. troops drove them off. They would await a better opportunity and the return of their captains, who were taken to the nearest military post only to be released.

In 1880 the bill for organizing "Oklahoma" as a Territory was introduced; but it was not until 1890 that it was made a law. Scenes of suffering, riot and rapacity were witnessed when at length the region was declared open to settlers. Owing to the political excitement, the crops were not sown speedily enough and some distress has been the outcome. Besides, the land did not prove by test to be equal to the highly colored pictures drawn. The capital was decided to be Guthrie, amid intense fervor. The legislature meets biennially for a session of one hundred and twenty days. The governor is Republican. Oklahoma comes forty-sixth in population among the States and Territories.

The figure is 61,834, but some 5,000 are claimed by Texas.

CHAPTER XXIII.

ALASKA.

ALASKA, the unorganized Northwestern Territory of the United States, bears about the same relation to "Our Western Empire" that Eastern Siberia and Kamschatka do to the Russian Empire; it is remote from the rest of the Empire, of vast territorial extent, but desolate and cold to the last degree, and can never become very populous, or of any remarkable economic value, until the plane of the ecliptic changes, and what is now an Arctic climate becomes torrid, or at least temperate.

We know very well what is said about the ameliorating effect of the Kuro-Siwo or Japan current upon the climate of those high latitudes; but the Gulf stream, a similar but more powerful current, has not rendered Iceland a paradise, or Novaya Zemla a fit habitation for men, though both are in quite as low latitudes as most of Alaska. We hope for some return of the national outlay from the fisheries, the fur trade, and the timber of Alaska. The precious metals may be found there—probably they will; and it may be possible on some favored spots to raise oats and barley, though not, to any extent, wheat or corn; but in a climate which is "nine months winter and the other three months late in the fall" how can either mining or agriculture be expected to prosper? Even the ice, which is always abundant, does not prove profitable as an article of export, the manufacture of ice by machinery having been so far perfected that it can be produced in San Francisco as cheaply as it can be imported from Alaska. No ice is now exported from the Territory.

That we may do no injustice to this great northwestern land, let us proceed to say what can justly be said in its favor.

Alaska is not, as is supposed by those who have given but little attention to the subject, a vast compact tract of territory. It has been not inaptly compared to the head and horns of a Texas bull—Yukon district forming the massive head, the Sitkan

shore and archipelago forming one horn, and the Aliaskan peninsula and the Aleutian Islands the other. The tips of the two horns are 60° of longitude or 3,000 miles apart; and from the southernmost of the islands of the Aleutian group, to Point Barrow in the Arctic ocean, the northernmost point of Yukon is a little more than 20° of latitude, or about 1,400 miles.

The area, according to the last report of the Land Office, is 577,390 square miles, or 369,529,600 acres. The shore lines around the islands and peninsulas are roughly estimated at 25,000 miles, or the entire circumference of the globe. The entire population of this Territory at the time of its acquisition from Russia was said to be about 29,000, of which 26,800 were said to be Indians and the remainder Caucasians and creoles. It has not materially increased since.

Topography—Mountains.—The Alaskan range, which seems to be a combination of the Coast, Cascade and Rocky Mountain Chains, passes northwestward through British Columbia a little east of the Sitkan Division of Alaska, enters the Yukon Division between the sixtieth and sixty-second parallels, and keeping a course parallel with and at a little distance from the left bank of the Yukon river, extends north nearly as far as Fort Yukon in latitude 66° , turns sharply south and forming the backbone of the Aliaskan peninsula and the Aleutian islands, each of which is a peak and generally a volcanic peak of the range, till finally its summits are all sunk in the deepest part of the northern Pacific ocean. This range has the loftiest peaks in North America outside of Mexico. Among these are Mount St. Elias, 19,500 feet in height; Mount Cook, 16,000 feet; Mount Crillon, 15,900; Mount Fairweather, 15,500; while of the partially submerged volcanic peaks, Sheshaldin is 9,000 feet above the water; Unalashka, 5,691 feet; Atka, 4,852 feet; Kyska, 3,700 feet; while poor Attu, the westernmost of the group, can only lift its head 3,084 feet above the deep valley of the Pacific.

In addition to the Alaskan range, there are several other mountain ranges of less elevation: among them are the Shakto-lik and Ulukuk Hills, near Norton's sound; the Yukon and Romanzoff Hills, north of the Yukon river: the Kayiuh and Nowika-

kat mountains east and south of the river, and a low range of hills bordering on the Arctic coast.

Rivers.—The great river of the Territory is the Yukon, whose sources are in the Chippewayan and Alaskan range, in British America. It is more than 2,000 miles in length, and is navigable, when not frozen over, for 1,500 miles. The delta across its five mouths is seventy miles wide, and the river itself is from one to five miles wide for the first 1,000 miles of its course. One of its largest tributaries, the Porcupine river, has most of its course above the Arctic circle. The Tananah, 250 miles in length, and the Nowikakat, 112 miles, are also tributaries of the Yukon. The Inland river, which flows into Kotzebue sound, and the Colville, which discharges its waters into the Arctic ocean, are the only other rivers north of the Yukon. South of it are the Kongskoquim, about 600 miles in length, the Nushagak, the Sushitna, the Atna or Copper river, and in the Sitkan division the Chilcat, the Takou and the Stickine. The last is about 250 miles in length.

It is divided by natural lines into three grand divisions, varying each from the other in natural characteristics and value :

1. The Sitkan Division, triangular in shape with the latitudinal line of $54^{\circ} 40'$ north for the southern boundary, and the longitudinal line of 141° west for the western, and on the north and east following the summits of the Coast Range of mountains between these points, with a proviso that this strip of shore shall never exceed ten marine leagues in width.

2. The Yukon Division, consisting of all the continent west of 141° as far north as the Frozen Ocean.

3. The islands not included in the Sitkan Division, comprising all the important islands of the Pacific Ocean north of $54^{\circ} 40'$, from Alaska to Kamschatka, known generally as the Aleutian Islands, and also the Aliaskan peninsula, and the Kodiak or Kadiak Islands, east of that peninsula, and the Pribyloff group, which are remarkable for the vast numbers of the fur-seal caught there.

In the first or Sitkan Division, there were in 1867 about 800 natives and some 800 whites and creoles ; in the Yukon, 8,000

natives, and 100 whites and creoles; and in the remainder of Alaska, the Island Districts, 17,300 natives and 1,300 whites and creoles.

This meagre population is grouped entirely around the sea-board and large rivers. A glance at the best map will show that of the interior of the Yukon District geographers know very little. What rivers and lakes are traced upon the maps are usually located upon slight and inaccurate information, derived from the natives. The interior of the islands and coasts longest peopled by a civilized race is almost altogether *ignota terra*. The coast line of Baranoff Island, on which Sitka is located, is well known and accurately defined upon the charts, but the interior is entirely unexplored. The only road at Sitka runs into the woods to the distance of a mile, and then stops before a wall of dense forest and undergrowth. The growth of stunted trees all along the shores of the islands and main land of the Sitkan Division is so thick as to be almost impenetrable. There is one instance, at least, of a man's having given an entire day to the work of penetrating inland, and at the end of his labor finding himself less than a mile from the shore.

Geology.—The greater part of this vast Territory has undergone changes from volcanic eruptions which have completely altered the character of its rocks. This is particularly the case in the Sitkan and Aleutian Divisions, in which there are sixty-one volcanoes which have been active within 150 years. The violence of the volcanic action seems to be decreasing, and of these sixty-one only ten are now in a condition of active and constant eruption. There are also very many extinct volcanoes in the Sitkan Division, and several are known in Yukon.

The immense shore line and the mountain slopes are crowded with glaciers; some of these are the most stupendous in the world. One of these is described as fifty miles in length, and terminating on the sea-coast in a perpendicular ice-wall 300 feet high and eight miles broad; another, thirty-five miles above Wrangell, on the Stickine river, is said to be forty miles long at the base, four or five miles across, and variously estimated at from 500 to 1,000 feet in thickness.

Mineral Wealth.—Alaska is known to possess coal beds of good quality and of great extent. Most of the coal beds are in the tertiary, and are properly lignite, though of the best quality. That in the Sitkan District has been so far changed by volcanic action that it is in some places a semi-anthracite. Petroleum is said to have been found of excellent quality and nearly odorless near the Bay of Katmai and on Copper river.

Copper, native, or very rich copper ores, have been found on Copper river, at Kasa-an bay, at Whale bay, below Sitka, and in Kadiak Island.

Iron exists all over the Territory, and graphite in several places. There is bismuth of fine quality on Vostovia Mountain, and gypsum, kaolin, marble, and the more common of the precious stones, agate, carnelian, amethyst, etc., are sufficiently plentiful.

Gold undoubtedly exists in the Territory, and probably at several points. In the Sitkan District there are several mines which have been worked to some extent on Baranoff (or Sitka) Island; two or three formerly worked on the streams falling into Stephen's passage, about seventy-five miles north of Fort Wrangell, at the mouth of the Stickine river.

The gold mines of the Stickine river are all located in British Columbia, and as the stores from which the most of the miners' supplies are furnished are upon the river, the business is diverted to the British possessions. Very many miners, however, winter at Wrangell, and freight bound to points on the Stickine river is at this place transferred to the small river steamers. Some gold claims have been located near Sitka, and specimens of ore sent to the assay office at Victoria have been found to contain a fair quantity of the precious metal. A quartz mill was erected during 1878, and it was intended to develop one of the mines, but the unpleasant weather and short days of winter will render it extremely difficult to carry on operations during more than six months of the year. No sufficient amount of capital has as yet been invested, nor have the mines been sufficiently worked to determine the mineral wealth of the Territory. Many who have given the subject great attention are fully convinced that valuable deposits of the precious metals exist.

A recent report from Sitka, states that gold had been discovered at Tahon, an Indian settlement on the river of the same name, about 150 miles north of Sitka, and near the border of British Columbia. Further reports only increased the excitement, and when specimens of the ore were brought to Sitka, which yielded \$200 of pure gold to 300 pounds of ore, the excitement became so intense that the people began to migrate thither in such numbers that the town was almost depopulated. It remains to be seen whether these mines prove as rich as they seem to promise. If they do, they will be profitable, although they can not be worked more than four or five months in the year. The Alaskan Mountains curve southwestward in the District of Yukon, and extend along the Aliaskan peninsula and through the Aleutian Islands. They seem to be the consolidation of the Rocky, Cascade and Coast Ranges. These mountains, according to all analogies, should contain both gold and silver, and in all probability they do. If the lodes are very rich, it may pay to work them, though the expense will be much greater than that of working mines farther south.

Zoology.—The animals of Alaska belong rather to the fauna of the Arctic than the Temperate Zone. The musk ox is found in Yukon District, and the reindeer, though of a different species from the European. The polar bear frequents the shores of the Arctic Ocean, and sometimes ventures as far south as Kotzebue sound. The elk and moose are seen, though rarely; the Rocky Mountain goat and sheep (the bighorn), several species of fox, the mink, beaver, marten, lynx, otter, sea-otter, black bear, wolverine, whistler, ermine, marmot, skunk, muskrat and wolf. Of *amphibia*, the seal, sea-otter, whale, porpoise, narwhal, etc., are abundant. Its birds are largely game birds, the ptarmigan, grouse, wild geese, teal, ducks, brant, etc., at certain seasons, and eagles, fishhawks, gulls, the great owl, etc., etc. Of the fish we speak elsewhere.

Let us now take up the divisions in detail, and endeavor to ascertain what each can produce with profit. And, first, of these :

Sitkan Division.—Mr. Blaine states that “no grass has been grown, and the small gardens at Sitka and Wrangell pro-

duce only a few of the hardiest vegetables. So great is the moisture that hay can not readily be cured, wheat ripened, nor potatoes raised. Even cabbages will not head. While our troops were in the Territory, a few cattle were with great difficulty kept in the District, but there is not at present a cow in the whole military Division of Alaska. Beef is a luxury most highly prized, the only meat being an occasional haunch of venison, and, in the proper season, small game. The mountains as a rule descend abruptly to the sea, and the small patches of level land are few and far between. In a word, agriculturally this whole district is absolutely worthless. There is no fodder for cattle, and the ground under the most careful cultivation yields nothing but the poorest varieties of the most insignificant vegetables. The hand of man can do little to add to the value of the Sitkan Division.

"The Sitkan Division does, however, possess a great abundance of most valuable ship-timber. The wood, known as yellow cedar, and sometimes called camphor-wood, which is the most durable of all woods for purposes of ship-building, is found in large quantities, and the Sitka spruce, inferior to this, but of very great value, is most plentiful. Logs of either of these woods can be easily procured at very small expense. Lumber has been sawed at a total cost of three dollars per thousand, which would easily command from twelve to fifteen dollars in San Francisco. There has been for some time a small saw-mill in Sitka, and another has recently been built in Klahwoch, but only trifling quantities of lumber have as yet been sawed at either place. The vast tracts of timber land in Oregon, Washington and Northern California will, for many years, supply the market of the Pacific coast.

"The fur trade of the Sitkan Division is at present the most important interest. The small amount of business now transacted at Sitka is entirely dependent upon the exchange of commodities for furs and peltries. For the past few years there has not been a sufficient demand for furs to make high prices or large gains. Fashion has frowned, at the dictation, perhaps, of the hard times, and competition among traders has assisted in reducing the profits. All the merchants profess to have lost

money, and it is the general opinion that none have made any. The fur-seal is not found in the waters adjacent to Sitka, but large quantities of other valuable furs are brought to this place and to Wrangell by the Indians and accumulated by traders. Fur-trading is in its very nature little suited to the permanent prosperity of a country. It demands the frontier and the wilderness as the seat of operations, and is perforce killed, as a country is settled and its resources developed. It is the enemy of civilization, and the more profitable it is, the sooner does it come to an end. Year by year, as the circle of population widens, the trappers are driven farther to the north. Astoria, for years the center of the trade, long ago yielded its supremacy, and to-day no furs are sold in that market at first hand. A large part of the world's supply must henceforth come from Alaska. She has no rival on this continent, and in the most important branches no formidable competitor on the globe.

"The fisheries of the Sitkan waters will perhaps ultimately prove the most valuable resource. They have, however, until very recently been of but little practical value. A few barrels of salted fish have been annually exported, and the inhabitants have to a large extent sustained life on the products of the sea. Within the past two years two salmon canneries have been built, and quite a large amount of money invested in this enterprise, but lack of information does not permit me to say whether the venture has proved successful.

"It was said in support of the Alaskan purchase that all the ice of the Pacific coast was imported from that Territory; but the value of the export was never in a single year more than \$30,000, and the successful introduction of machinery for the production of ice artificially has caused the business to rapidly decline and disappear. No ice is now exported from any portion of the Territory."

2. *The Yukon District.*—Of this region the massive head of the bull, whose left horn, the Sitkan Division, we have just been considering, it has been the fashion with some writers to speak in the most glowing terms. It was "the garden of Alaska." Here wheat and all the other cereals except corn, and all the tubers and

vegetables required in the market gardens or the markets of the Pacific coast, could be raised in the greatest profusion. In the hot, short summer, everything, it was said, grew so rapidly that a vast population could be sustained here. The later commissioners and explorers do not corroborate these glowing accounts. The second division, called the Yukon, has been less explored than either of the others. There were formerly a few Russian posts in the Territory, but these have now been abandoned. At Cook's Inlet, at the mouth of the Sutchino river, and at many points on the Yukon river, sufficient grass is found to afford the best of fodder for cattle, and wild berries and smaller fruits flourish in abundance. The range of the thermometer at a distance from the sea-coast is far greater than in Sitka, or near the sea-line, and the summers are so warm as to produce the most luxuriant vegetation. On the Yukon river the sun has been known in the month of July to burst a spirit thermometer, graduated up to 120°, and the winters are Arctic in severity. There is no trouble in curing hay at these points, and there is said to be good grazing land for cattle. It will of course be necessary to shelter the herds during more than half of the year, and fattening for market will not therefore be profitable. Fruit-trees will not flourish, and while some experiments have been made with barley and oats, which are said to have been satisfactory, not a grain of wheat has ever been brought to maturity. South of the Alaskan Range, save at Cook's Inlet and on the peninsulas, there is no good land, and north of the mountains only persistent and careful cultivation will enable the farmers to reap satisfactory results. The only evidence which we have as to the land is from experiments made by the Russians and the scientific officers of the Western Union Telegraph Company. They are both very unsatisfactory, especially those of the former, as they were intrusted to Indians, who, being utterly ignorant of agriculture and cattle-breeding, conducted them most unskillfully. There are also said to be valuable coal-beds, but as no examination was ever made by competent geologists, this can not be safely affirmed. Undoubtedly there is considerable free copper in the district, as the natives formerly employed this metal in the

manufacture of wagons and domestic articles, but its location is at present unknown. Fur animals abound, especially those living upon the land. Fort St. Michael was formerly one of the chief trading posts of the Russians, and many of the fox and beaver skins now sent from the north Pacific are trapped upon the Yukon. Good timber is also found in many portions of the division, but it is not so accessible nor so valuable for ship-building as that about Sitka. Fish of all kinds, especially cod and halibut, are very abundant at Cook's Inlet and along the entire coast.

3. *The Island District*, which includes the Aliaskan peninsula, the large island of Kadiak and the group of islands which surround it, the Aleutian Archipelago, comprising the three groups of the Fox, and Andreanowsky, and the Blijnie or Rat Islands, the whole constituting the right horn of the bull; and with these the Pribyloff group (the home of the fur seal), Nounivak, Lawrence, and the St. Matthew group, come next in review. "These islands are the most valuable portion of our Russian purchase. The island of Kadiak and others of the Aleutian group contain very good arable land. The cattle distributed by the Russian Commercial Company succeeded here far better than in any other part of the Territory. There is good pasture land, and hay can be made with greater ease than at the mouth of the Columbia river. There is also an encouraging report that a good variety of potatoes can be grown, although 'the tubers are said to be small.' There is not much timber of good quality upon these islands, but the fisheries are of a very great value. The Aleuts, who are the chief native race, are by nature the most honest people in the world. On the islands where there are no forests, driftwood furnishes the principal supply of fuel, and it is said that the unwritten law with reference to the rights of property is so strong that, should an Indian discover a log of wood which it is not then convenient for him to carry away, he may, by carrying it above high-water mark and placing it at right angles to the line of the beach, leave it with full assurance that it will not be disturbed until his convenience warrants the removal."

“The chief sources of our revenue from Alaska are in what is known as the Pribyloff Islands. St. Paul and St. George, two of the group, now furnish almost all of the seal-skins used in the world. These islands abound with seal, and being the property of the United States, are leased by the government to the Alaska Fur Company. The number of seals killed each year is limited by law to 100,000, and for these a royalty of two dollars each is paid. If the law restricting the number of seals annually killed is strictly enforced, this industry will for many years furnish the chief part of the revenue from Alaska, and constitute the most valuable product of the Territory.”

A correspondent of the *Portland Oregonian*, writing from Sitka gives the following account of the fisheries :

“Alaska is destined to supply the world with fish. Its waters abound in halibut, herring, cod, and salmon ; indeed there is hardly a species of which representatives cannot be found. While those above named exist here in endless profusion, flounders, black bass, rock-cod, trout, and the delicious eulocous, with other varieties, appear in vast schools, supplying the natives with abundant food at all seasons of the year.

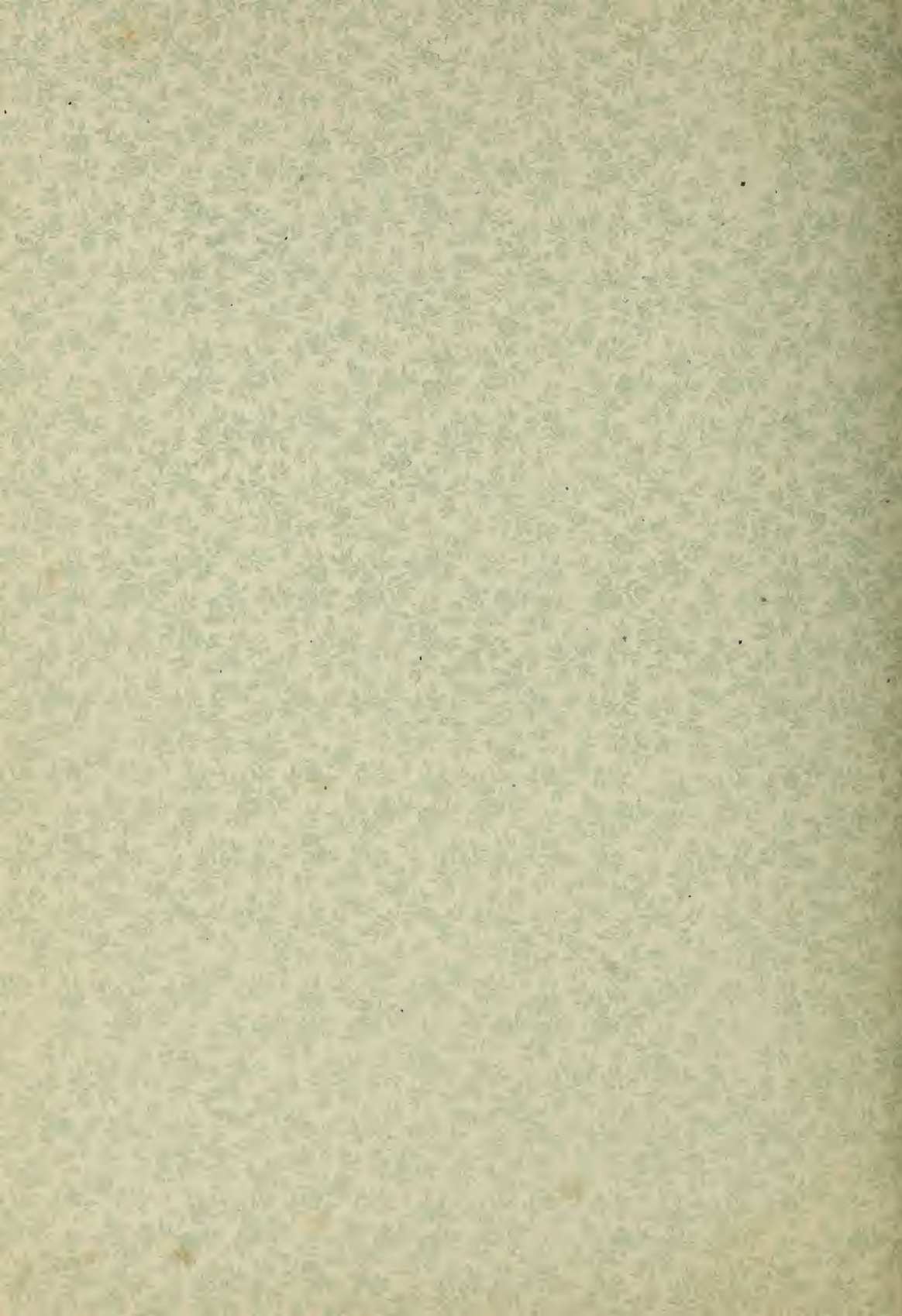
“At Klowak, sixty miles from Fort Wrangell, the North Pacific trading and packing company have a large fishery in operation, where during the present year especial attention has been paid to herring. The catch this spring was very successful, the fish being in prime condition, and not only larger in size but of better flavor than ever before sent to market. 170 barrels were sent to Portland for the purpose of introducing the fish to dealers, and if desired ten times that amount could have been secured.

“Five miles from the town of Sitka the firm of Cutting & Co., have a large cannery erected where thousands of salmon are put up every year to meet the demand made for Alaska salmon from the Eastern markets. While the salmon from these waters have not the gustable richness, and lack the savory flavor of Columbia river salmon, there are many that prefer the Alaskan species, particularly in the Eastern States and foreign countries.

Mr. Blaine thus describes the voyage from Nanaimo, the last port of British Columbia, to Sitka :

“The picturesque parts of the voyage are found between Nainaimo and Sitka. The steamer sweeps through a narrow strait guarded on either hand by snow-capped mountains, and so narrow that despite all your knowledge of perspective it seems as if the shores meet as you look up the channel from the bow of the ship. On either side mountains, green at the base and white at the summit, overhang the water. A patch of marble cropping through the trees forms an occasional and welcome spot of color in the monotonous green, and the ripple of a cascade agreeably breaks the stillness which everywhere reigns supreme. For days not a living thing is seen ; no animal upon the land, no Indian on the water, no bird in the air. The waves, washed by the wheel against the shore, tremble into silence ; the hills which echoed the whistle sullenly grow calm once more, and you seem shut in by the forces of nature, and in the power of the genii of sea and strand. There is apathy everywhere, activity nowhere. High up in the sky the sun rolls lazily along, completing the task in twenty hours which elsewhere he accomplishes in fourteen. The nights glitter with weird light. The sunset is reflected by the sunrise. The west yet glimmers with the streaks of day, while in the east jocund morn stands tiptoe on the misty mountain-top. At 10 at night the finest print is read with ease, and at 3 in the morning the sun streaming into the state room wakens you from sleep.”

We can hardly commend Alaska as a favorable point for emigrants, unless it be those hardy Norsemen whose constant encounters with the Arctic climate have rendered them proof against its hardships ; but development, though slow in coming, will yet surely reach this far-off land of ice. There will probably be no great change in the climate. Neither wheat nor dairy products will be exported in any large quantity, but the seal and sea-otter furs, and the furs and pelts of land animals, will increase in value and perhaps in numbers ; the magnificent forests will supplement the fast diminishing timber product of the Pacific coast, and the fisheries will furnish abundant and healthful food to millions who to-day hardly know that Alaska exists.





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